APPENDIX A

Appendix A-1 Corridor Definition Studies Needs Analysis 'What-if' Scenarios

Table A-1 – 2030 Needs Analysis Modeling "What-if" Scenarios

Base Model Utilized for Scenario	Roadway Network Description
2030 Base Future Network	- All freeway corridors including 60 extension - Williams Gateway connects to 60 extension - 6 lanes on existing US 60
2030 Base Future Network	- All freeway corridors - Without 60 extension - Williams Gateway connects to existing US 60 - 4 lanes on existing US 60
2030 Base Future Network	- No freeway corridors - Williams Gateway ends at Meridian - 6 lanes on existing US 60
2030 Base Future Network	- All freeway corridors - Without 60 extension - Williams Gateway connects to existing US 60 - 6 lanes on existing US 60
2030 Base Future Network	- All freeway corridors - Williams Gateway ends at North-South - Without 60 extension - 6 lanes on existing US 60 - east/west corridors removed
2030 Base Future Network	- All freeway corridors - Williams Gateway ends at North-South - Without 60 extension - 4 lanes on existing US 60 - east/west corridors removed
2030 Base Future Network	- All Freeway Corridors (WG to NS Corridor) - Without US 60 Extension - 4 lanes on existing US 60
2030 Base Future Network	- All Freeway Corridors (WG to NS Corridor) - Including US 60 Extension (4 Lanes) - 4 lanes on existing US 60
2030 Base Future Network	- Closed Freeway Loop (Williams Gateway Freeway connects to US 60 Extension) - 4 Lane Arterial on "North-South", north of Williams Gateway Freeway
2030 Base Future Network	- All Freeway Corridors (WG to NS Corridor) - Including US 60 Extension (4 Lanes) - 4 Lane Arterial on "North-South", north of Williams Gateway Freeway
2030 Base Future Network	- All Freeway Corridors (WG to NS Corridor) - Including US 60 Extension (6 Lanes) - 4 Lane Arterial on "North-South", north of Williams Gateway Freeway

APPENDIX B – ENVIRONMENTAL OVERVIEW SUPPORTING MATERIALS

Appendix B-1 Environmental Databases Search Results

Table B-1 – Underground Storage Tanks (UST) Database Search Results

Facility ID	Facility Name	Address/ Location	Relative Location	Status
0-009805	Florence Jct ADOT Easements	US 60 eastbound/Florence Jct, Florence Junction, AZ 85232	Within 2000 feet of study area (ENE portion)	1 tank – temporarily closed as of 11/06/01
0-009804	Florence Jct ADOT Easements	US 60 westbound/Florence Jct, Florence Junction, AZ 85232	Within 2000 feet of study area (ENE portion)	5 tanks – all temporarily closed as of 11/06/01
0-000392	City Services Annex	575 E Baseline Ave, Apache Junction, AZ 85219-9205	Within study area (northern portion)	2 tanks – both in-use
0-008953	New Magma Irrigation & Drainage	34630 N Schnepf Rd, Queen Creek, AZ 85242-9229	Within 2000 feet of study area (western portion)	2 tanks – both removed on 11/12/99
0-009759	Ganzel Farms	25 W Ocotillo Rd, Queen Creek, AZ 85242-8859	Within 1000 feet of study area (WNW portion)	2 tanks – one in-use, other closed but no date indicated
0-008863	Rittenhouse Auxiliary Field	7 miles SE of Williams AFB, AZ 85242	Within study area (WNW portion)	1 tank – removed on 11/09/95
0-001622	Greg Combs	3379 E Combs Rd, Queen Creek, AZ 85242-9153	Within study area (western portion)	3 tanks – all removed on 04/01/89
0-009225	Tanner Companies Plant 17	Attaway Rd & Hwy 287, Coolidge, AZ 85228	Within study area (SW portion)	2 tanks – both removed on 09/18/90
0-007443	L R Johnson Settlement Trust	Arizona Farms Rd & Attaway Rd, Florence, AZ 85232	Within study area (WSW portion)	2 tanks – both removed on 06/10/92
0-004841	BCW Inc dba Sunward Materials	14152 Attaway Rd, Coolidge, AZ 85228	Within study area (SW portion)	2 tanks – both removed on 12/01/89
0-005757	A J Waste Systems Inc	3690 S Cactus Rd, Apache Junction, AZ 85219-9416	Within 1000 feet of study area (northern portion)	2 tanks – one removed on 02/21/91, other removed on 10/16/98
0-009839	Apache Jct Unified School	2535 S Ironwood Dr, Apache Junction, AZ 85220-7100	Within 2000 feet of study area (northern portion)	3 tanks – all in-use
0-009834	AJ's Mini Mart	3940 S Ironwood Dr, Apache Junction, AZ 85220-7152	Within 1000 feet of study area (northern portion)	2 tanks – one in-use, other closed but no date indicated

Table B-1 – Underground Storage Tanks (UST) Database Search Results (continued)

Facility ID	Facility Name	Address/ Location	Relative Location	Status
0-009672	RC's Quickmart	2851 S Tomahawk Rd, Apache Junction, AZ 85219-9207	Within 2000 feet of study area (northern portion)	2 tanks – one in-use, other closed but no date indicated
0-009831	Freeman Trust Property	454 N Pinal Pkwy, Florence, AZ 85232	Within 2000 feet of study area (SE portion)	2 tanks – both removed on 03/09/02
0-009605	Chevron/Minit Mart #607	520 N Pinal Pkwy, Florence, AZ 85232	Within 2000 feet of study area (SE portion)	2 tanks – one in-use, other closed but no date indicated
0-006483	Dutchman Auto/RV	770 S Pinal Pkwy, Florence, AZ 85232-9718	Within 2000 feet of study area (SE portion)	2 tanks – both removed on 07/29/98
0-003913	Pinal County Interprise Serv	900 S Pinal Pkwy, Florence, AZ 85232	Within 2000 feet of study area (SE portion)	3 tanks – all removed on 06/23/98
0-007957	Coury Brothers Ranch	Sierra Vista Dr & Queen Creek, Queen Creek, AZ 85242	Within study area (WNW portion)	1 tank – removed on 08/12/92
0-004266	St Francis Farms Inc	29560 N Cooper Rd, Florence, AZ 85232-9701	Within study area (south-central portion)	3 tanks – all removed on 03/01/87
0-010033	Farm Maintenance Yard	27830 N Yeager, Florence, AZ 85232	Within study area (south-central portion)	1 tank – temporarily closed as of 11/01/04
0-003463	Unit Training Equipment Site	600 Track Rd, Florence, AZ 85232-9704	Within study area (SE portion)	2 tanks – both removed on 03/19/97
0-000582	AT&T Florence AZ3180	Valley Farm Rd Hwy 287 2 miles, Florence, AZ 85232	Within study area (southern portion)	1 tank – removed on 11/26/91
0-009425	Old Garage	99 E Butte, Florence, AZ 85232	Within study area (SE portion)	2 tanks – both removed on 01/14/00
0-002159	Florence Waste Water Treatment	300 S Plant Rd, Florence, AZ 85232	Within study area (SE portion)	1 tank – in-use
0-003099	Ernest W McFarland Estate	Rt 1 Box 8 Canal Rd, Florence, AZ 85232	Within study area (southern portion)	2 tanks – both removed on 12/01/88
0-000378	ADOT/Pinal County Maintenance	2207 S Willow, Florence, AZ 85232	Within study area (SE portion)	3 tanks – all removed on 05/30/91
0-008409	Florence Automotive	625 S Main St, Florence, AZ 85232	Within study area (SE portion)	2 tanks – both in-use

Table B-1 – Underground Storage Tanks (UST) Database Search Results (continued)

Facility ID	Facility Name	Address/ Location	Relative Location	Status
0-008362	Clemans Cattle Co.	90 N Main St, Florence, AZ 85232	Within study area (SE portion)	3 tanks – all removed on 09/04/98
0-008361	Mobil Gas Station/Clemans	30 N Main St, Florence, AZ 85232	Within study area (SE portion)	2 tanks – both removed on 07/29/98
0-005473	Circle K #2702938	1500 S Main St, Florence, AZ 85232	Within study area (SE portion)	2 tanks – both in-use
0-005115	Express Stop #107	1501 S Main St, Florence, AZ 85232	Within study area (SE portion)	10 tanks – four removed on 07/31/03, six removed on 10/24/90
0-001280	Circle K Store #2700661	1615 S Main St, Florence, AZ 85232	Within study area (SE portion)	4 tanks – two in-use, two removed on 05/20/96
0-001031	Chevron #9-0560	25 N Main St, Florence, AZ 85232	Within study area (SE portion)	4 tanks – all removed on 07/08/93
0-009371	Central Arizona Medical Center	450 W Adamsville Rd, Florence, AZ 85232	Within study area (SE portion)	2 tanks – one in-use, other removed on 09/08/99
0-001631	Florence Project	14605 E Hunt Hwy, Florence, AZ 85232-9486	Within study area (southern portion)	3 tanks – two removed on 12/01/89, third removed on 07/18/90
0-007419	Florence Unified School District	230 E Florence Heights, Florence, AZ 85232	Within study area (SE portion)	1 tank – removed on 08/22/91
0-007616	American Telephone & Telegraph	6.4 miles on Hwy 287 S 2.8, Florence, AZ 85232	Within study area (southern portion)	1 tank – removed on 11/26/91

Table B-2 – Leaking Underground Storage Tanks (LUST) Database Search Results

Facility ID	Facility Name	Address/Location	Relative Location	Status
0-007443	L R Johnson Settlement Trust	Arizona Farms Rd & Attaway Rd, Florence, AZ 85232	Within study area (WSW portion)	1 case file – closed on 02/09/95
0-004841	BCW Inc dba Sunward Materials	14152 Attaway Rd, Coolidge, AZ 85228	Within study area (SW portion)	2 case files – one closed on 05/11/99, other closed on 11/30/99
0-003913	Pinal County Interprise Serv	900 S Pinal Pkwy, Florence, AZ 85232	Within 2000 feet of study area (SE portion)	1 case file – closed on 08/02/00
0-007957	Coury Brothers Ranch	Sierra Vista Dr & Queen Creek, Queen Creek, AZ 85242	Within study area (WNW portion)	1 case file – closed on 10/21/99
0-003463	Unit Training Equipment Site	600 Track Rd, Florence, AZ 85232-9704	Within study area (SE portion)	1 case file – closed on 06/18/97
0-000582	AT&T Florence AZ3180	Valley Farm Rd Hwy 287 2 miles, Florence, AZ 85232	Within study area (southern portion)	1 case file – closed on 06/13/96
0-009425	Old Garage	99 E Butte, Florence, AZ 85232	Within study area (SE portion)	1 case file – open (priority level 2)
0-000378	ADOT/Pinal County Maintenance	2207 S Willow, Florence, AZ 85232	Within study area (SE portion)	2 case files – one closed on 10/20/98, other closed on 07/23/99
0-008409	Florence Automotive	625 S Main St, Florence, AZ 85232	Within study area (SE portion)	1 case file – open (priority level 2)
0-008361	Mobil Gas Station/Clemans	30 N Main St, Florence, AZ 85232	Within study area (SE portion)	3 case files – two open (both priority level 2), third closed on 06/09/00
0-005473	Circle K #2702938	1500 S Main St, Florence, AZ 85232	Within study area (SE portion)	2 case files – one open (priority level 2), other closed on 03/08/00
0-005115	Express Stop #107	1501 S Main St, Florence, AZ 85232	Within study area (SE portion)	6 case files – all closed on 03/09/98
0-001280	Circle K Store #2700661	1615 S Main St, Florence, AZ 85232	Within study area (SE portion)	4 case files – three closed on 10/07/96, fourth closed on 04/20/01
0-001031	Chevron #9-0560	25 N Main St, Florence, AZ 85232	Within study area (SE portion)	1 case file – closed on 11/20/96
0-007419	Florence Unified School District	230 E Florence Heights, Florence, AZ 85232	Within study area (SE portion)	1 case file – closed on 05/14/98
0-008187	New Arizona Farms North Inc	28576 N Attaway Rd, Queen Creek, AZ 85242-8410	Within study area (WSW portion)	1 case file – closed on 08/27/93

Table B-3 – Incident Logbook Database Search Results

Incident ID	Incident Date	Address/Location	Relative Location	Chemical	Quantity
98-010-E	07/20/97	19473 N Pinal Pkwy, Florence, AZ	Within 2000 feet of study area (SE portion)	Drug lab chemicals*	0.5 gal
86-141	09/19/86	Idaho & US 60, Apache Junction, AZ	Within study area (northern portion)	Gasoline	Unknown
84-093	10/04/84	US 60, MP 207.3, Apache Junction, AZ	Within 2000 feet of study area (NE portion)	Diesel	7000 gals
89-228	08/01/89	US 60 & SR 88, Apache Junction, AZ	Within study area (northern portion)	Transformer oil	2-5 gals
01-092-E	01/31/01	NE corner Ranch & Kenworthy Rd, Queen Creek, AZ	Within study area (WNW portion)	Secondary reuse water	500,000 gals
92-157-C	10/22/92	AZ Farms Rd & Attaway Rd, Florence, AZ	Within study area (WSW portion)	Diesel	20 gals
94-049-F	09/26/94	S3T3SR8 Sun Valley Farms, Queen Creek, AZ	Within study area (western portion)	Diesel	Unknown
94-055-B	09/22/94	4500 E Sagebrush, Queen Creek, AZ	Within study area (western portion)	Misc*	Various size bottles
00-042-D	09/09/99	Skyline Dr & Quail Run Lane, Queen Creek, AZ	Within study area (western portion)	Unknown	(5) 55-gal drums
97-001-B	01/08/97	Skyline & Sierra Vista Dr Queen Creek, AZ	Within study area (western portion)	Unknown*	None
95-019-F	07/18/95	1 m S US 60 200ft W Iron Horse (thought to be Ironwood), Apache Junction, AZ	Within 1000 feet of study area (northern portion)	Diesel	10-15 gals
89-043	02/08/89	Off Rolling Ridge, Queen Creek, AZ	Within study area (western portion)	Fungicide*	1 dry quart

Table B-3 – Incident Logbook Database Search Results (continued)

Incident ID	Incident Date	Address/Location	Relative Location	Chemical	Quantity
90-075-A	07/18/90	Attaway Rd, Florence, AZ	Within study area (SW portion)	Diesel	100 gals
86-098	07/28/86	4000 S Tomahawk, Apache Junction, AZ	Within 2000 feet of study area (northern portion)	Caustic solution	5000 gals
94-010-E	08/28/94	Florence PD	Within study area (SE portion)	Mortar*	81mm
87-002	01/06/87	Copper Basin RR RRMP 974, Florence, AZ	Within study area (southern portion)	Sulfuric acid	6500 gals
91-114-B	10/23/91	US 60, 700-900 Blk, Apache Junction, AZ	Within study area (northern portion)	Unknown liquid	55 gals
92-028-D	09/15/92	Hwy 89 (thought to be Hwy 79) S20T2SR10E, Florence, AZ (closer to Florence Junction)	Within 2000 feet of study area (ENE portion)	Unknown	Unknown

* Only threat of release on date reported

Appendix B-2 Listed and Proposed species that may occur in Pinal County, Arizona

Table B-4 – Listed and Proposed species that may occur in Pinal County, Arizona

Species		Status	Habitat Elevation Range (Ft above MSL)
Birds			
Bald Eagle	Haliaeetus leucocephalus	T	varies
California Brown Pelican	Pelecanus occidentalis californicus	E	Varies
Cactus Ferrunginous Pygmy-Owl	Glaucidium brasilianum cactorum	E	<4000
Mexican Spotted Owl	Strix occidentalis lucida	T	4100-9000
Southwestern Willow Flycatcher	Empidonax traillii extimus	E	<8500
Yellow-Billed Cuckoo	Coccyzus americanus	C	<6500
Yuma Clapper Rail	Rallus longirostris yumanensis	E	<4500
Fish			
Desert Pupfish	Cyprinodon macularius	E	<5000
Gila Topminnow	Poeciliopsis occidentalis occidentalis	E	<4500
Loach Minnow	Tiaroga cobitis	T	<8000
Razorback Sucker	Xyrauchen texanus	E	<6000
Spikedace	Meda fulgida	T	<6000
Gila Chub	Gila intermedia	PE	2000-3500
Mammal			
Lesser Long-Nosed Bat	Leptonycteris curasoae yerbabuenae	E	<6000
Plants			
Acuna Cactus	Echinomastus erectocentrus acunensis	C	1300-2000
Arizona Hedgehog Cactus	Echinocereus triglochidiatus arizonicus	E	3700-5200
Nichol's Turk's Head Cactus	Echinocactus horizonthalonius var nicholii	E	2400-4100
Total Endangered, Threatened, and Proposed Species:		17	

Key:
E — Endangered
T — Threatened
CH — Critical Habitat
PE — Taxa proposed for listing as endangered
PT — Taxa proposed for listing as threatened
PCH — Critical habitat which has been proposed
C — Candidate species for which the Fish and Wildlife Service has on file sufficient information on the biological vulnerability and threats to support proposals to list as endangered or threatened

THE STATE OF ARIZONA
GAME AND FISH DEPARTMENT
2221 WEST GREENWAY ROAD, PHOENIX, AZ 85023-4399
(602) 942-3000 • AZGFD.GOV

July 20, 2005

Mr. Robert Forrest
Kimley-Horn and Associates, Inc.
7878 N. 16th St.
Suite 300
Phoenix, AZ 85020

Re: Special Status Species Information for **Pinal County Corridors Definition Study.**

Dear Mr. Forrest:

The Arizona Game and Fish Department (Department) has reviewed your request, dated July 15, 2005, regarding special status species information associated with the above-referenced project area. The Department's Heritage Data Management System (HDMS) has been accessed and current records show that the special status species listed on the attachment have been documented as occurring in the project vicinity (2-mile buffer). In addition this project does not occur in the vicinity of any Proposed or Designated Critical Habitats.

The Department's HDMS data are not intended to include potential distribution of special status species. Arizona is large and diverse with plants, animals, and environmental conditions that are ever changing. Consequently, many areas may contain species that biologists do not know about or species previously noted in a particular area may no longer occur there. Not all of Arizona has been surveyed for special status species, and surveys that have been conducted have varied greatly in scope and intensity.

Making available this information does not substitute for the Department's review of project proposals, and should not decrease our opportunities to review and evaluate new project proposals and sites. The Department is also concerned about other resource values, such as other wildlife, including game species, and wildlife-related recreation. The Department would appreciate the opportunity to provide an evaluation of impacts to wildlife or wildlife habitats associated with project activities occurring in the subject area, when specific details become available.

If you have any questions regarding this letter, please contact me at (602) 789-3606. General status information, county and watershed distribution lists and abstracts for some special status species are also available on our web site at http://www.azgfd.gov/hdms.

Sincerely,

Ginger Ritter

Ginger L. Ritter
Project Evaluation Program Specialist

SSS:glr

Attachment

cc: Rebecca Davidson, Project Evaluation Program Supervisor
Russ Haughey, Habitat Program Manager, Region VI

AGFD # 07-18-05(06)

Special Status Species within 2 Miles of the Pinal County Corridors Definition Study

NAME	COMMON NAME	ESA	USFS	BLM	STATE
Agosia chrysogaster	Longfin Dace	SC		S	
Athene cunicularia hypugaea	Western Burrowing Owl	SC		S	
Catostomus insignis	Sonora Sucker	SC		S	
Gopherus agassizii (Sonoran Population)	Sonoran Desert Tortoise	SC			WSC
Nyctinomops femorosaccus	Pocketed Free-tailed Bat			S	

No Critical Habitats in project area. AGFD # 07-18-05(06). Proposed Pinal County Corridors Definition Study.

Arizona Game and Fish Department, Heritage Data Management System, July 20, 2005.

GUIDELINES FOR HANDLING SONORAN DESERT TORTOISES ENCOUNTERED ON DEVELOPMENT PROJECTS

Arizona Game and Fish Department
Revised January 17, 1997

The Arizona Game and Fish Department (Department) has developed the following guidelines to reduce potential impacts to desert tortoises, and to promote the continued existence of tortoises throughout the state. These guidelines apply to short-term and/or small-scale projects, depending on the number of affected tortoises and specific type of project.

Desert tortoises of the Sonoran population are those occurring south and east of the Colorado River. Tortoises encountered in the open should be moved out of harm's way to adjacent appropriate habitat. If an occupied burrow is determined to be in jeopardy of destruction, the tortoise should be relocated to the nearest appropriate alternate burrow or other appropriate shelter, as determined by a qualified biologist. Tortoises should be moved less than 48 hours in advance of the habitat disturbance so they do not return to the area in the interim. Tortoises should be moved quickly, kept in an upright position at all times and placed in the shade. Separate disposable gloves should be worn for each tortoise handled to avoid potential transfer of disease between tortoises. Tortoises must not be moved if the ambient air temperature exceeds 105 degrees Fahrenheit unless an alternate burrow is available or the tortoise is in imminent danger.

A tortoise may be moved up to two miles, but no further than necessary from its original location. If a release site, or alternate burrow, is unavailable within this distance, and ambient air temperature exceeds 105 degrees Fahrenheit, the Department should be contacted to place the tortoise into a Department-regulated desert tortoise adoption program. Tortoises salvaged from projects which result in substantial permanent habitat loss (e.g. housing and highway projects), or those requiring removal during long-term (longer than one week) construction projects, will also be placed in desert tortoise adoption programs. *Managers of projects likely to affect desert tortoises should obtain a scientific collecting permit from the Department to facilitate temporary possession of tortoises.* Likewise, if large numbers of tortoises (>5) are expected to be displaced by a project, the project manager should contact the Department for guidance and/or assistance.

Please keep in mind the following points:

- These guidelines do not apply to the Mohave population of desert tortoises (north and west of the Colorado River). Mohave desert tortoises are specifically protected under the Endangered Species Act, as administered by the U.S. Fish and Wildlife Service.

- These guidelines are subject to revision at the discretion of the Department. We recommend that the Department be contacted during the planning stages of any project that may affect desert tortoises.

- Take, possession, or harassment of wild desert tortoises is prohibited by state law. Unless specifically authorized by the Department, or as noted above, project personnel should avoid disturbing any tortoise.

RAC:NLO:rc

Burrowing Owl Artificial Nest Box Project

An Arizona Partners in Flight Habitat Substitution Project

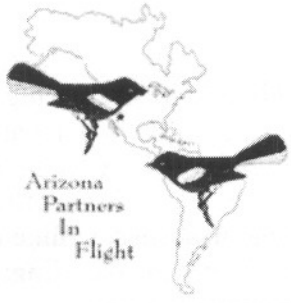


Photo by Greg Clark

Project and Problem Summary:

In the Eastern United States artificial nest boxes were built by volunteers and organizations to try to increase the populations of Bluebirds. The nest boxes replaced natural tree cavities that had been lost when the trees were lost. The effort was a huge success. The same thing can be done for Burrowing Owls, except the cavity is in the ground. If someone chops down all the trees in a forest, everyone understands that this will have a devastating effect on the wildlife. It is not as obvious that as much damage can be done to some species when holes in the ground are covered up. Efforts are under way to figure out where replacement burrows can be installed that will have the most benefit. Some burrows have been installed to replace burrows lost nearby to development, and much of the following material shows this work. However, these burrows are part of rescue work done in conjunction with Wild At Heart (a rehabilitation group in Cave Creek, Arizona). As important to the owl as rescue work is, it is different from figuring out where to install burrows to attract new populations of owls. Phase I of the project is about finding landowners who will provide burrow sites and learning which sites the Burrowing Owl prefers. We need your help finding sites and installing burrows. Surprisingly, this is not some problem to be solved in the "wilderness." The burrows need to be installed in urban areas where development is already completed . That means all around where people live. We need niche areas, like around commercial buildings or urban greenbelts, where the burrows can be installed away from trees and buildings but near possible food sources (mice and insects). There is still time to reverse the steep decline in the Burrowing Owl population, with your help. If you live in the greater Phoenix area, you can help us directly with this project. Because Arizona is the winter home for many owls that breed in Canada and the states north of Arizona, this project can affect the entire owl population of North America. We need burrow sites and help digging the holes. If you can help, or if you would like more information about how to help the owls in your area, contact Greg Clark at:

480-961-4046 (or manually type in the e-mail address b i r d i n f o @ m i r r o r - p o l e . com without spaces)

The Burrowing Owl is Federally protected by U.S. Laws pertaining to Migratory Species. If you are contemplating an operation that could destroy a burrow, or cover up a burrow with dirt, possibly killing the owl inside, this is against the law. You can find out more about this where the list of protected birds

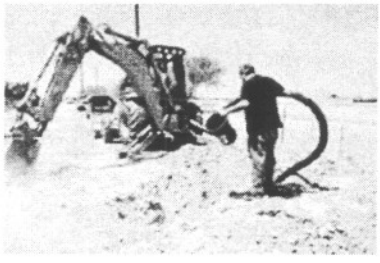
is given on a U.S. Fish and Wildlife website:

http://migratorybirds.fws.gov/intrnltr/treatlaw.html#mbta

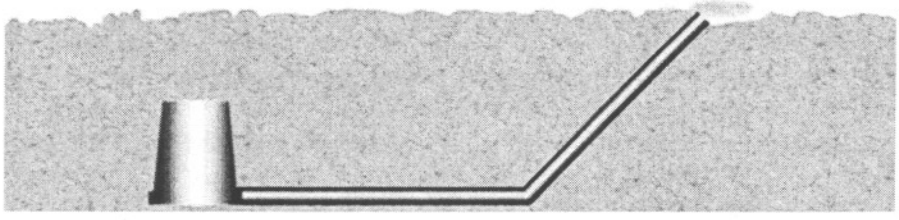
http://migratorybirds.fws.gov/intrnltr/mbta/mbtandx.html#alpha1 The list of protected birds can be found here, look under Owls to find Burrowing Owl.

More about the Burrowing Owl and artificial burrows:

One of North America's most engaging and beneficial birds, the Burrowing Owl is experiencing a decline in population as nest sites are lost to development. Unlike birds that nest in trees, the Burrowing Owl is dependent on a ground burrow dug by other animals. If the animals are displaced, and the burrows covered over, then the Burrowing Owls must also leave. Eventually, the population of owls begins to fall merely because of a lack of suitable ground nest sites. Unlike other owls that are typically most active at night, the Burrowing Owl is most active during the day. Engaging to watch, the owl also makes a wide range of intriguing sounds. Typically perched near its burrow during the day, the owl is often easy to spot and is a great educational resource for anyone interested in learning more about wildlife. Surprisingly, this owl often selects natural nest sites on bare ground in open areas with little surrounding vegetation. Many commercial and city-maintained areas in the greater Phoenix area would be ideal for artificial burrows because the open spaces around the buildings are often bare ground, free of grass and large trees. The idea that these types of spaces could be used for habitat substitution for the Burrowing Owl has led to this project and we need to find interested groups that can help us make new home sites for this owl. Working in conjunction with Wild at Heart, based in Cave Creek, Arizona, some artificial burrows have been provided to replace burrows that are being lost due to development. This work shows what is involved to install a burrow.

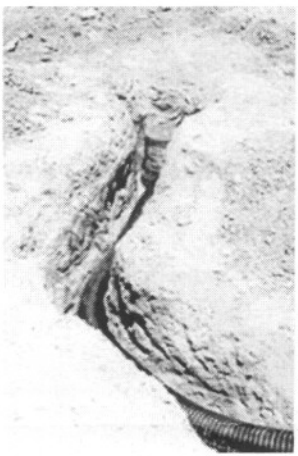


Here volunteer Brian DaSilva gets ready to check the depth of the hole and tunnel dug by a backhoe to see if the orange bucket and black hose will fit properly. A typical hole is dug 4 feet deep so that the average temperature in the burrow will be around 75 degrees F. The developer worked with us both to provide a site for the burrows in Peoria and to carry out the earth excavation, so that very little manual labor was involved. Burrows can also be dug by hand.



An underground burrow is built using a plastic bucket for the burrow and 4" flexible irrigation hose for the tunnel from the ground to the burrow. The orange bucket costs about 3 dollars at Home Depot and the 4" hose costs about 6 dollars for the 12 feet required for a typical burrow. This means that materials are less than 10 dollars per burrow. For protection from dogs, in locations where the burrows are not in protected areas (like in fenced-off areas) a rigid PVC pipe must be used to protect the burrow entrance. See the special link for hardening a burrow against dog attacks. Holes must be provided in the bucket and hose to allow water to escape into the ground, the flexible hose can be purchased with perforations. In addition, the hose must make a double turn between the burrow and the surface to simulate natural burrows. The simple diagram above only shows the tube bending toward the surface, but it also needs to

bend horizontally 90 degrees. The photograph below shows the bucket and tubing in place before being buried. The section from the buurow to the bend should be at a 4-foot depth. If you want to proceed on your own, contact us for more detailed information.



This is an example of a burrow dug by hand, rather than by backhoe. There must be at least two feet of dirt on top of the over-turned bucket. The photo shows the bucket and hose before being buried.

This burrow in Chandler became the home for owls that were displaced for a 200-home development project.

Once an area is slated for development where there are Burrowing Owls present, someone must carefully investigate all the burrows to make sure no owls are inside and then carefully collapse the burrow so no owl can return to be trapped inside. One of the first things that happens at a development site is land preparation that moves all the surface dirt around. Sadly, this can trap the owls in the burrow. Investigating these burrows is where Wild At Heart comes in. Holders of both Arizona Game and Fish and U.S. Fish and Wildlife permits for doing this type of work, Wild At Heart can investigate and safely collapse the burrows and, where necessary, relocate the owls to new sites. Follow the next link to see some burrow sites in Chandler, Arizona where the burrows had to be collapsed. Fortunately, a nearby homeowner offered to help us with our artificial burrow project and so the owls were able to relocate only a few hundred feet from where they were born, in habitat much like where they lived before.

Additional Burrow Construction Information and Protection Needed for Domestic Dog Attacks

Arizona Burrowing Owl Distribution

More Burrow Sites and Owl Photos

Red_Hawk Power_Plant_Release_Site New June, 2002. See where 25 Burrowing Owls were released.

Paseo Verde School New May, 2003. See the owls in one of the burrows using infrared video cameras.

mirror-pole.com home

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APPENDIX C – CORRIDOR DEFINITION STUDY PERFORMANCE ANALYSIS

technical memorandum

Corridor Definition Study Performance Analysis

prepared for

Arizona Department of Transportation

prepared by

Cambridge Systematics, Inc.
555 12th Street, Suite 1600
Oakland, California 94607

with

Lima & Associates, Inc.
Kimley-Horn & Associates, Inc.

August 2005

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1.0 Introduction

This technical memorandum describes the system performance evaluation of corridor alternatives analyzed as part of the Arizona Department of Transportation's (ADOT) three Corridor Definition Studies. The technical memorandum describes both the methodology used to calculate system performance for several performance factors and the results of this analysis. These results will be used to support the overall analysis of corridor alternatives for each of the three studies.

The performance analysis presented here is one piece of the overall analysis process for ADOT's Corridor Definition Studies. The findings presented need to be evaluated in context with other information generated for these studies, including:

- The demand for the proposed corridors;
- The impact of the proposed corridors on the congestion of the arterial network and existing state transportation system;
- The feasibility of implementing a particular corridor; and
- The system performance and congestion benefits of a new corridor relative to the cost to develop that corridor.

The results presented here are not intended to stand alone. The identification of a recommended corridor concept will utilize this system performance information in concert with the above noted information. The details of how this analysis fits with the overall analysis can be found in the second working paper for each of the studies.

2.0 Methodology

The methodology for calculating system performance is based on the performance-based planning direction established by ADOT as part of the Arizona Long-Range Transportation Plan (MoveAZ). The process was developed using several key tools and is reported at several levels. This section of the technical memorandum describes the following:

- The scenarios that were evaluated;
- The performance measures used to evaluate these scenarios, including a summary of tools and methods to calculate each measure; and
- The levels of analysis for the evaluations.

2.1 Scenarios

The needs analysis process used for each of the three ongoing ADOT Corridor Definition Studies included identification of potential corridor alternatives. Over 20 individual concepts were evaluated as part of the needs analysis process. For the purpose of the system performance analysis, five key alternatives were evaluated, including the following:

1. **Base Future**. This scenario represents the expected future transportation system in the overall study area in 2030. It is based on existing plans that overlap the study area and assumptions about the basic arterial network needed to support expected future development. Each of the scenarios is compared to the base future.[1]

2. **Enhanced Future**. The enhanced future scenario evaluates the benefits that would result from additional investments in the arterial system in Pinal County. It is focused primarily on developing a more mature arterial system in the portion of Pinal County that is currently State Trust Land, but is expected to have substantial additional

[1] Additional information about the base future scenario can be found in *Working Paper #1*, which was developed for each of the three Corridor Definition Studies. These reports are available at: http://tpd.azdot.gov/planning/corridorstudies.php.

population by 2030.[2] In addition, this scenario assumes that all of the existing state highways in Pinal County that are currently two lanes will be widened to four lanes.

3. **SEMNPTS Corridors**. This is the first primary concept analyzed as part of the overall needs analysis. This concept included each of the four corridors identified as part of the *Southeast Maricopa County/Northern Pinal County Transportation Study* (SEMNPTS).

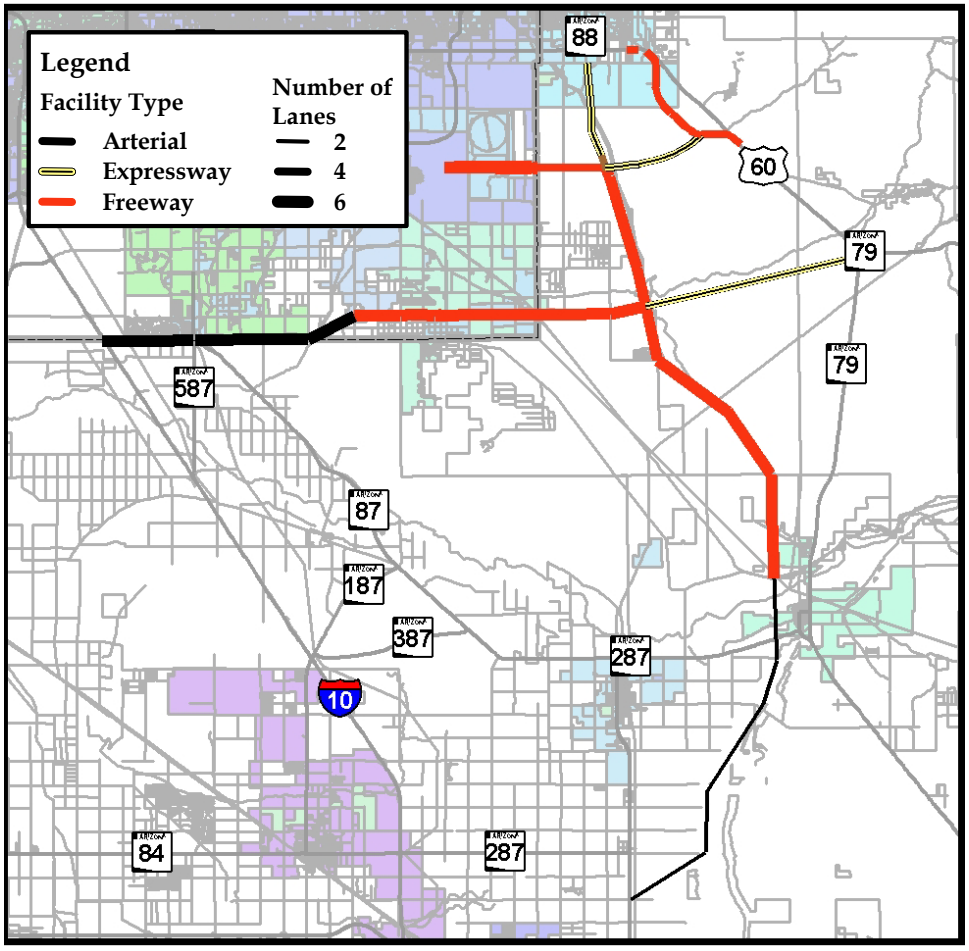
4. **Refined All Corridors**. Based on demand estimates from the base future concept and SEMNPTS Corridors, a refined all corridors analysis was identified. This includes an updated specification for each of the four corridors identified in SEMNPTS. This concept is described in Figure 2.1.

5. **Corridor Concept**. This concept is based on the results of the Refined All Corridors concept and represents the final result of several separate model runs analyzed during the needs analysis process. The concept includes two new corridors: 1) a combined Williams Gateway to North-South corridor and 2) a U.S. 60 reroute, both as six-lane facilities. The two corridors are presented in Figure 2.2.

6. **Corridor Concept Plus**. This concept is based on the corridor concept, but includes widening the existing state highway system in Pinal County to four lanes.

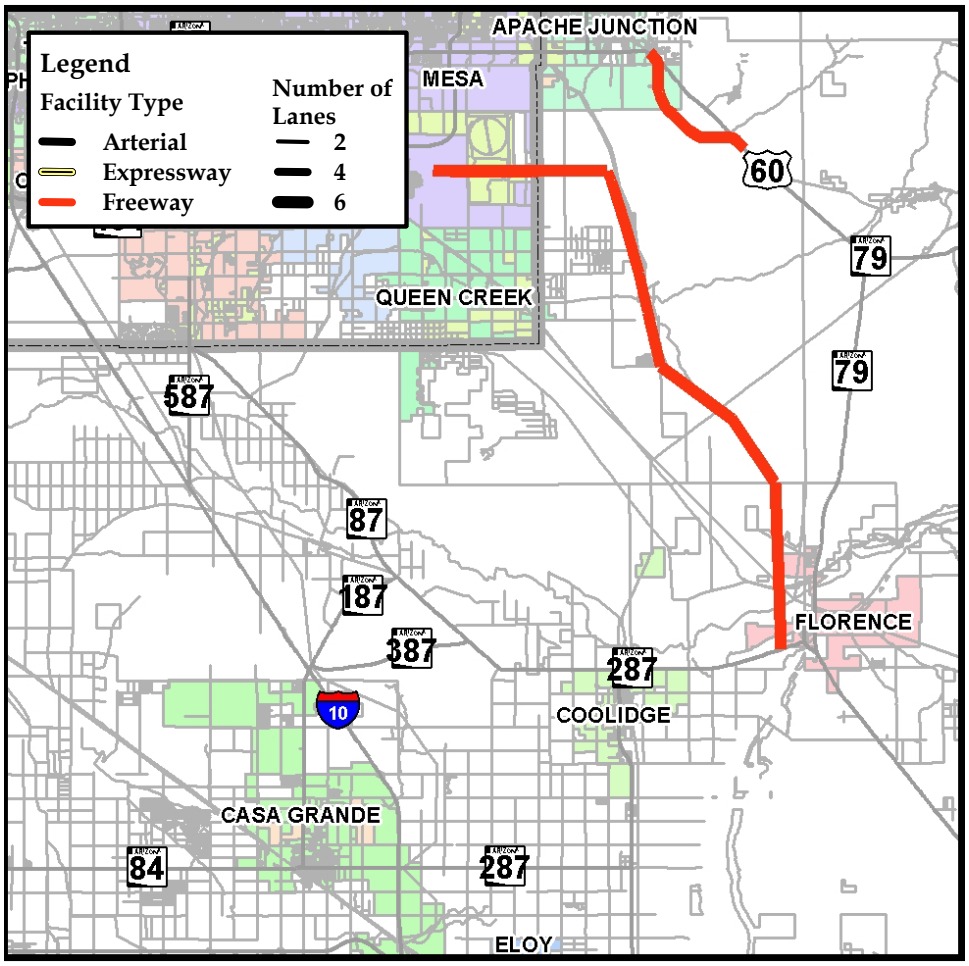
[2] Additional information about expected population and employment growth in the study area can be found in the *Pinal County Planning Model: Socioeconomic Estimates and Forecasts* document. This report is available at: http://tpd.azdot.gov/planning/corridorstudies.php.

Figure 2.1 Refined All Corridors Concept



Note: This is the Refined All Corridors concept, based on demand estimates from the Base Future concept at the All Corridors (SEMNPTS) concept. This includes an updated specification for each of the four corridors identified in SEMNPTS

Figure 2.2 Corridor Concept



2.2 Performance Measures and Tools

The alternatives described above were evaluated using a common set of performance measures that are linked to key planning factors established by ADOT as part of MoveAZ. The five factors evaluated as part of this process include:

- **Mobility**;
- **Safety**;
- **Accessibility**;
- **Resource conservation**; and
- **Environmental justice.**

A performance analysis database was created to generate measures using analytic procedures and data from several sources, including:

- The **Pinal County Planning Model** (PCPM) is a travel demand model developed for the three Corridor Definition Studies. The model was the primary source of data on roadway conditions, projected traffic volumes, and roadway capacities.

- The **ITS Deployment Analysis System** (IDAS) is a sketch-planning tool that was designed to estimate the potential benefits of ITS and operational investments using data from a travel demand model. As part of the IDAS development process, performance measures were developed to evaluate alternatives, including data needed to support these analyses. IDAS includes measures of congestion, safety, air quality, fuel consumption, and economic impacts. For the purposes of this evaluation process, IDAS routines were used in the evaluation of the safety and resource conservation performance factors.

- The **Highway Capacity Manual** (HCM) is a guidebook published by the Transportation Research Board as a means to standardize the techniques used to evaluate the quality of service provided by various transportation facilities. The HCM was used to develop measures of congestion and level of service for the mobility performance factor.

- The **Highway Performance Monitoring System** (HPMS) is a dataset that represents public roads throughout the country. It provides a summary of roadway conditions, features, traffic volumes, and other attributes. These data were used to supplement data from the PCPM, including truck percentages and other related information.

Table 2.1 presents the performance measures used to address each of the key planning factors identified above.

Table 2.1 System Performance Measures

MoveAZ Planning Factor	Performance Measures	Tools
Mobility	• Vehicle Miles of Travel (VMT)	• PCPM
	• Vehicle Hours of Travel (VHT)	• PCPM
	• Percent of Network that is Congested	• PCPM, HCM
Safety	• Crash rate (Fatality, Injury, PDO)	• IDAS, HPMS, PCPM
Accessibility	• Access to existing employment centers	• PCPM, GIS Spatial Analysis
Resource conservation	• Fuel consumption	• PCPM, HPMS, IDAS
	• Emissions (CO2, NOx, HC)	• PCPM, HPMS, IDAS
Resource Conservation/ Accessibility	• Environmental Justice	• 2000 Census, GIS analysis

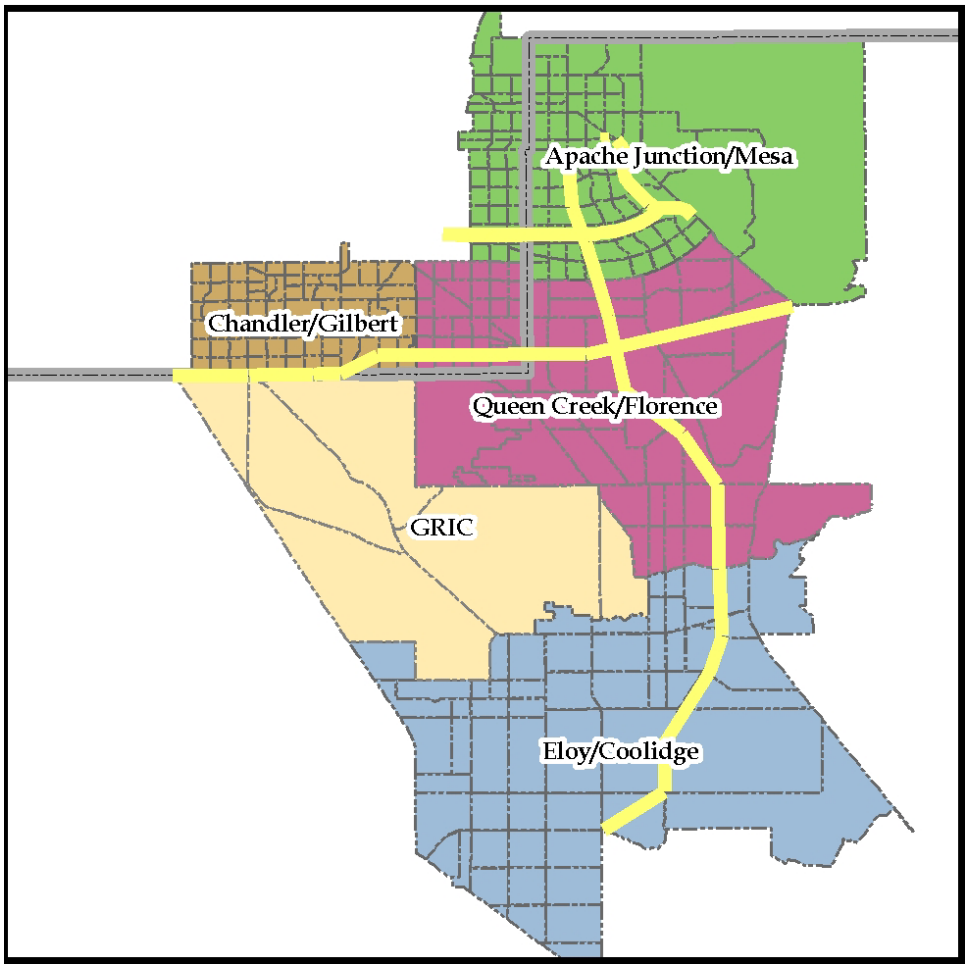
The methods used to operationalize and calculate each of the measures are described within the results section below.

2.3 Level of Analysis

The performance analyses were conducted at several levels. The primary level was for the overall transportation system. This system-level analysis included the entire study area as defined by the PCPM, except roads to the west of I-10 and to the east of the U.S. 60/SR 79 junction. In addition, the performance evaluation was calculated for each of five separate study areas that represent key divisions in the overall study area (Figure 2.3). The subareas were divided as follows:

- Apache Junction, Mesa, and Gold Canyon;
- Chandler and Gilbert;
- Queen Creek, San Tan, and Florence;
- The Gila River Indian Community (GRIC); and
- Coolidge, Eloy, and Casa Grande.

Figure 2.3 Study Areas for Corridor Performance Measure Evaluation



3.0 Results

This section describes the detailed performance analysis for each of the four key performance factors. For each factor, additional information is provided about the methodology used to calculate the specific measures and performance results are presented.

3.1 Mobility

The following three key measures were used to estimate mobility:

1. **Vehicle miles of travel** (VMT) provides a system-level estimate of total travel on the system. Increases in VMT above the base future scenario reflect latent demand that is not satisfied with the expected future transportation network.

2. **Vehicle hours of travel** (VHT) provides a system-level estimate of the total time spent traveling on the roadway network. The relative change in VHT and VMT compared to the base scenario represents travel time savings provided by new investments.

3. **Percent of miles in congested condition** provides an assessment of the level of congestion experienced on the roadway network. This measure is captured at two levels. The first level is the percent of highway miles that have a vehicle to capacity ratio over 1 (indicating that the number of vehicles attempting to use the road exceeds the capacity). The second level is the percent of highway miles that have a vehicle to capacity ratio over 1.5. This latter condition can be thought of as roads that are highly congested.

VMT grows slightly over the base future scenario for all scenarios, except enhanced future (Table 3.1). This growth, ranging between one-half of a percent and about 2.5 percent, represents additional latent demand that is not satisfied by the base future case. The decline in VMT for the enhanced future of 1.5 percent suggests that trips are more direct in this scenario, but that the additional capacity does not provide improved mobility for the latent demand.

Table 3.1 Mobility Performance Measures by Scenario

Scenario	Total VMT	VMT Deviation from Base	Total VHT	VHT Deviation from Base	Percent of Network Congested (v/c > 1)	Percent of Network Very Congested (v/c > 1.5)
Base Future	32,113,122		4,551,023		41.0%	7.9%
Enhanced Future	31,619,784	-1.54%	3,261,492	-28.33%	32.2%	3.0%
SEMNPTS Corridors	32,973,195	2.68%	2,682,051	-41.07%	26.1%	2.1%
Refined All Corridors	32,955,369	2.62%	2,497,108	-45.13%	24.4%	1.7%
Corridor Concept	32,438,746	1.01%	3,207,121	-29.53%	29.2%	3.5%
Corridor Concept Plus	32,252,439	0.43%	2,994,424	-34.20%	27.9%	2.8%

For all scenarios, vehicle hours of travel decline significantly, representing improved travel conditions and the use of shorter travel paths for some trips. The decline in hours of travel is lowest for the Enhanced Future scenario (just under 30 percent) and greatest for the Refined All Corridors scenario (about 45 percent). The Corridor Concept scenario provides just slightly more benefit than the enhanced future, in part due to the additional demand attracted to these new facilities. The Corridor Concept Plus scenario shows much greater benefits, as a number of congested state routes (such as SR 87 through the Gila River Indian Community) are widened to four lanes in this scenario.

Overall congestion declines in each of the scenarios and mileage that is very congested improves significantly. Total congested mileage declines from about 40 percent of all roadway miles in the Base Future scenario to between 25 and 30 percent, depending on the scenario. The Refined All Corridors scenario provides the greatest benefit, with the Corridor Concept Plus providing close to the same benefit (within 3 percent). Roadways that are very congested are reduced by over 50 percent in all scenarios (from almost 8 percent to between 1.5 and 3.5 percent).

By subarea, changes in mobility are directly related to locations of proposed routes. Table 3.2 compares the mobility measures across the subareas for the Base Future and Corridor Concept Plus scenarios. VMT increases in the Apache Junction/Mesa and Queen Creek/Florence subareas in the Corridor Concept Plus scenario. Similarly, VHT declines are most significantly in these two subareas (between 45 and 60 percent reduction in total VHT in the Corridor Concept Plus scenario), but also improves substantially in both the Eloy/Coolidge and the GRIC subareas (between 20 and 30 percent reduction in VHT). It is especially notable that the corridors both increase traffic and reduce total hours of travel, representing substantial delay savings from the new facilities.

Table 3.2 Mobility Performance Measures by Subarea and Scenario

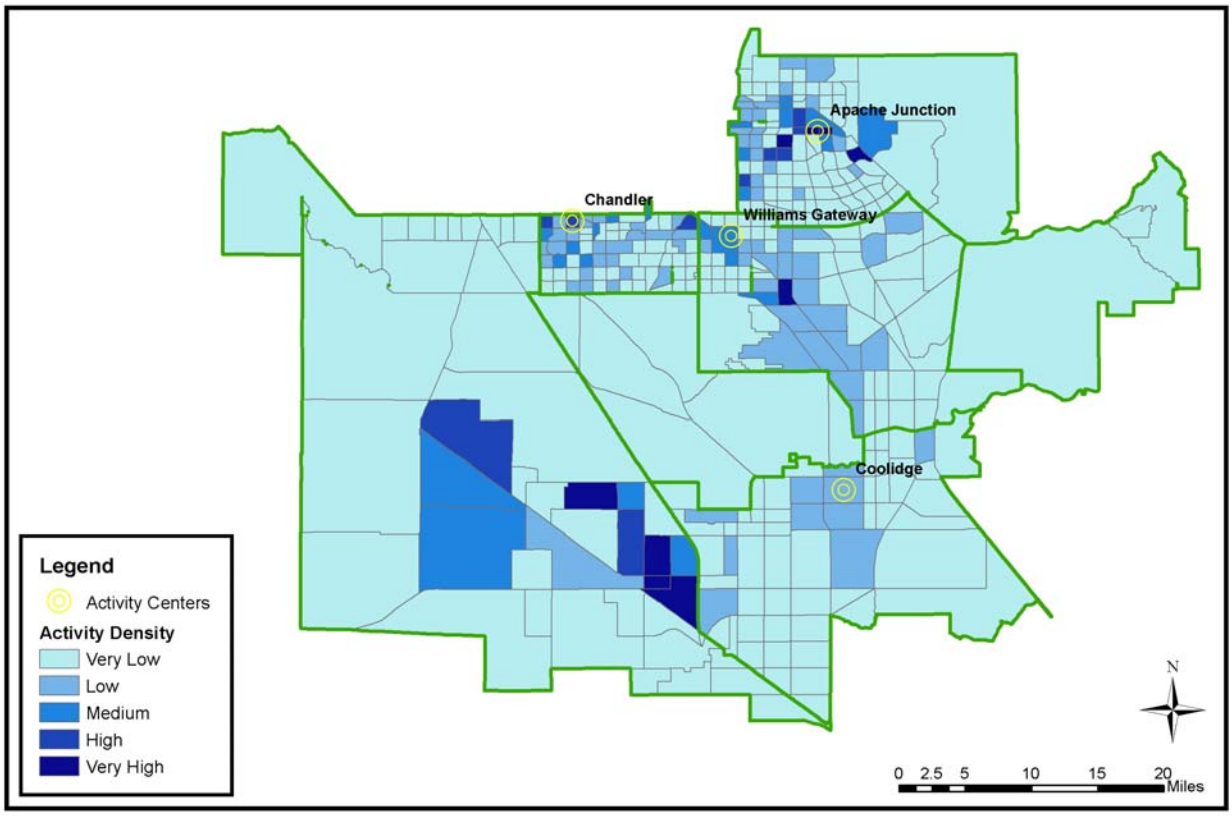
	Total VMT	VMT Deviation from Base	Total VHT	VHT Deviation from Base	Percent of Network Congested (v/c > 1)	Percent of Network Very Congested (v/c > 1.5)
Apache Junction/Mesa						
Base Future	7,896,442		741,843		30.9%	2.8%
Corridor Concept Plus	8,252,473	4.5%	308,496	-58.4%	7.4%	0.2%
Chandler/Gilbert						
Base Future	6,273,553		895,672		71.8%	1.6%
Corridor Concept Plus	6,148,579	-2.0%	878,372	-1.9%	69.9%	1.4%
Eloy/Coolidge						
Base Future	6,042,944		218,030		7.6%	0.4%
Corridor Concept Plus	5,405,756	-10.5%	170,819	-21.7%	2.8%	0.4%
GRIC						
Base Future	5,298,075		1,120,126		68.2%	33.0%
Corridor Concept Plus	5,055,372	-4.6%	790,131	-29.5%	64.9%	14.1%
Queen Creek/ Florence						
Base Future	6,602,108		1,575,353		65.2%	20.1%
Corridor Concept Plus	7,390,260	11.9%	846,607	-46.3%	40.8%	6.1%

The most significant congestion benefits are in the Apache Junction/Mesa subarea. Total network congestion is reduced from about 30 to about 7 percent in this subarea in the Corridor Concept Plus, and less than 1 percent of the overall network is very congested. The new corridors have a substantial impact on congestion in Eloy/Coolidge as well, but this area is expected to have relatively little congestion at all (just over 7 percent of roadway miles are congested). The corridors have relatively little impact on overall congestion for either the Chandler/Gilbert or the GRIC subareas. However, in the Corridor Concept Plus scenario, the percent of miles that are very congested in the GRIC subarea is less than one-half that of the Base Future scenario. Finally, the Corridor Concept Plus scenario does benefit the Queen Creek/Florence subarea in both miles that are congested and very congested, but a significant percentage of roadway miles remain congested (about 40 percent). This reflects the lack of a mature arterial network in the study area, especially for north-south movements in Queen Creek.

3.2 Accessibility

For this analysis, accessibility captures the ease of access to key activity centers. An indication of regional accessibility is the accessibility to key activity centers in the region such as employment centers, regional shopping centers, airports, and other regionally critical activities. Figure 3.1 illustrates the distribution of the activity throughout the PCPM model area and identifies five activity centers that were chosen for this analysis: Apache Junction, Chandler, the Williams Gateway Airport, and Coolidge.

Figure 3.1 Distribution of Activity and Selected Activity Centers



Accessibility is presented in two ways:

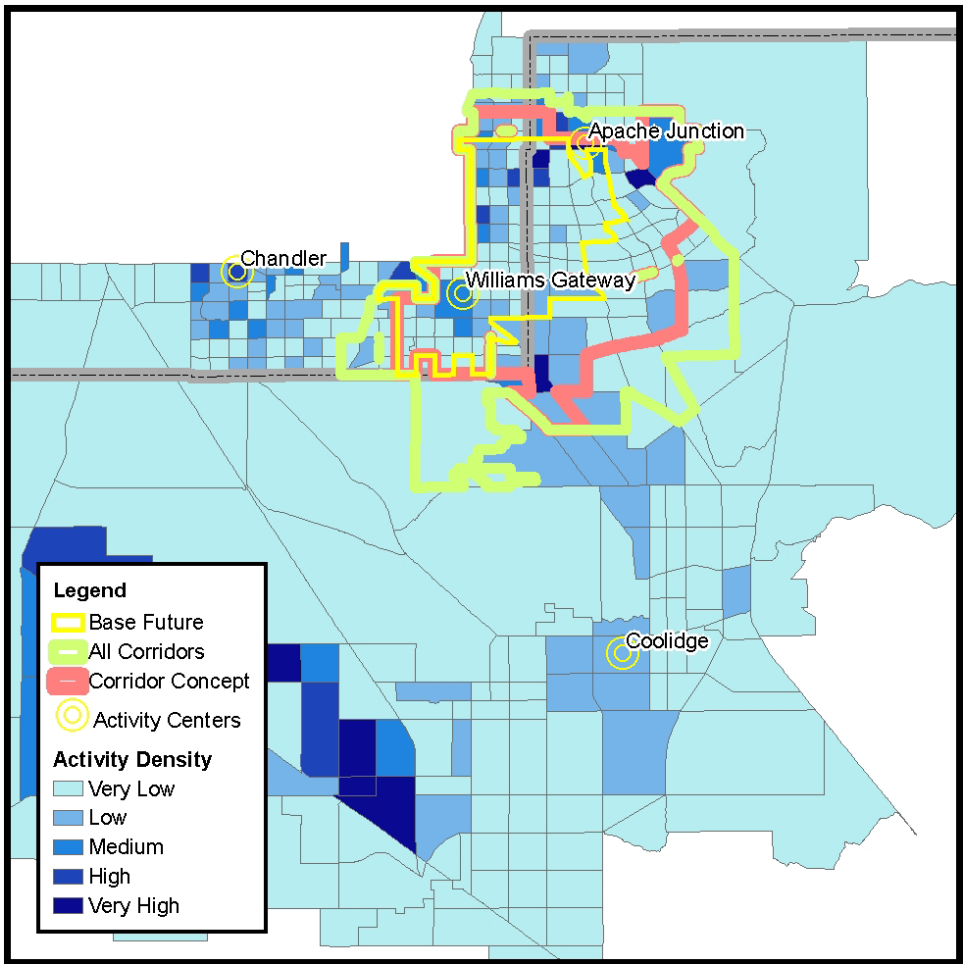
1. **Color gradient maps** are used to present a geographic representation of the travel time to reach the specific activity centers identified above. These illustrate the amount of time it takes to travel to a zone containing a key activity center, using 15-minute increment bands.

2. **Trips within travel time bands** are also presented for each activity center to understand what percent of total traffic can access each activity center within the travel time

bands. The travel time for each trip to the activity center zone is calculated based on the predicted volumes on roadways in the study area and partitioned into the travel time bands. Total trips are presented for zones within a band and the activity center.

The proposed scenarios provided increased accessibility for the major activity centers identified above. Figure 3.2 presents the portion of study area zones that can access the Williams Gateway activity center within 30 minutes. Results are provided for each of three scenarios: 1) Base Future, 2) Refined All Corridors, and 3) Corridor Concept. Zones that are within the bands can be accessed within 30 minutes. Similar results have been developed for 15-minute and 45-minute bands. These results can be found in Appendix A.

Figure 3.2 30-Minute Accessibility Bands by Scenario
Williams Gateway Activity Center

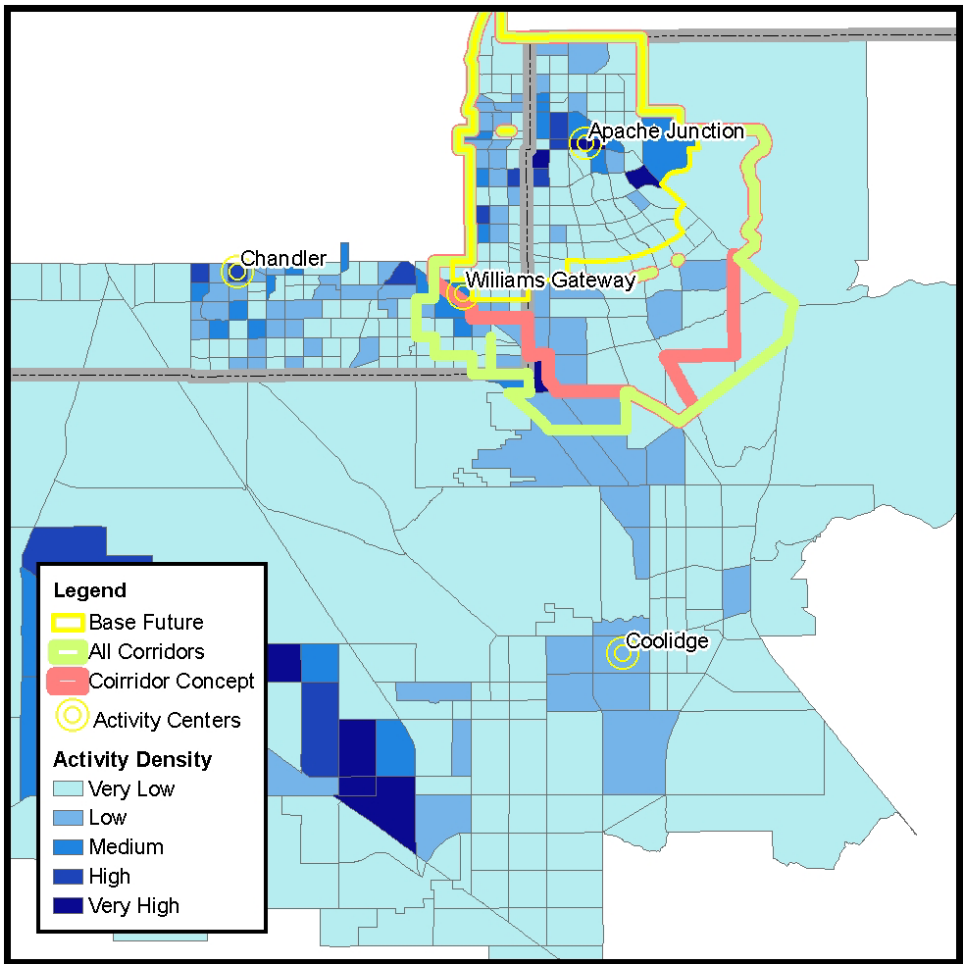


Overall, both the Refined All Corridors and Corridor Concept provide improved access to the Williams Gateway activity center. Most of the improved access is on the eastern part

of the study area, with the Refined All Corridors scenario providing some additional access to the west and south.

Figure 3.3 presents the same information for the Apache Junction activity center. For this activity center, both the Corridor Concept and the Refined All Corridors scenarios provide additional access. Again, the Refined All Corridors scenario provides additional access to the west and south of the PCPM area, but at a relatively lower level than for the Williams Gateway activity center.

Figure 3.3 30-Minute Accessibility Bands by Scenario
Apache Junction Activity Center



The other two activity centers show no real differences among the scenarios in the number of zones that can access the activity centers within 30 minutes.

By examining accessibility at a trip-based level, the impact of each zone becomes clearer. For example, a small zone that produces a large number of trips will be relatively more

significant than a small zone that produces few. Also, the number of trips generated by a zone between scenarios may change even if it remains in the same travel time band.

Analysis of travel times with respect to the base case shows significant improvement across all activity centers and scenarios. For almost all activity centers, the majority of trips fall within the zero to 15-minute band, and almost none originate outside of the 45-minute band (Table 3.3). This reflects the estimates of average trip lengths identified by the PCPM, as well as the congestion and travel times that people in this region currently accept.

Table 3.3 Trips within 15-Minute Time Band for Each Activity Center and Scenario

	Apache Junction	Chandler	Williams Gateway	Coolidge
Base Future	50.1%	58.3%	27.9%	73.5%
Enhanced Future	55.2%	63.0%	28.7%	82.7%
Refined All Corridors	77.9%	61.2%	47.1%	83.1%
Corridor Concept	73.6%	60.7%	30.3%	81.9%
Corridor Concept Plus	73.6%	60.7%	31.0%	83.0%

With respect to variation between scenarios, activity centers in closer proximity to proposed corridors show the greatest improvement when corridor scenarios are enacted (Apache Junction, Williams Gateway). Those located in a more neutral zone (Chandler, Coolidge) show less variation with the addition of corridors in comparison to the Base Future scenario. Of the corridor options, the Refined All Corridors scenario has the most impact followed by the Corridor Concept Plus scenario. This is logical as it reflects the degree of development in each scenario.

Much of the improvement with the implementation of each scenario comes in the shift in trips from the 15 to 30-minute band to the 0 to 15-minute band. Changes in the Williams Gateway activity center show relatively little change in the 0 to 15-minute band, but a visible shift from the 30 to 45-minute band to the 15 to 30-minute band (Table 3.4). The notable exception is the Refined All Corridors scenario, where the 0 to 15-minute band increases by 20 percent. However, for trips less than 30 minutes (the first two bands combined), the Refined All Corridors and the Corridor Concept Plus scenarios are within a few points.

Table 3.4 Time Band Breakdown for Williams Gateway Activity Center by Scenario

	0-15	15-30	30-45
Base Future	27.9%	9.7%	23.0%
Enhanced Future	28.7%	24.3%	12.9%
Refined All Corridors	47.1%	25.8%	14.5%
Corridor Concept	30.3%	27.2%	14.0%
Corridor Concept Plus	31.0%	32.2%	8.3%

3.3 Safety

Safety is measured using **total crashes** by type (fatality, injury, and property damage crashes). Analysis breaks this figure into subcategories – fatality, injury, and property-damage-only (PDO) crashes – using predetermined ratios dependant on the network. Crash statistics are presented per million vehicle miles traveled. Crash statistics were estimated using crash rates developed for IDAS. These rates vary by type of facility and average speed.

Results of a detailed analysis of safety findings show that the three corridor scenarios have the greatest impact on decreasing accident rates on a systemwide level, ranging from 6.5 to almost 9 percent (Table 3.5). The change in the Enhanced Future scenario is negligible. For total crashes, the Refined All Corridors scenario has the greatest impact with a decrease in total crashes of nearly 9 percent. The difference between Corridor Concept and Corridor Concept Plus proposals at the systemwide level is insignificant.

Examining the type of incident, most of the additional benefit realized as part of the Refined All Corridors scenario (over the Corridor Concept and Corridor Concept Plus scenarios) is in property damage crashes. Fatalities and injuries are each only about two percent lower in the Refined All Corridors Scenario.

Three subareas show interesting variations in crash rate improvements by scenario (Table 3.6). In the Chandler/Gilbert study area, the Refined All Corridors scenario actually increases the crash rate. This is because crash rates often increase with increased speeds, creating potential new safety hazards. In particular, the severity of incidents increases sharply with increased speeds. Notably, this analysis does not account for any potential mitigation measures that might help reduce crashes in a particular corridor. For this subarea, the Corridor Concept Plus provides the greatest reduction in crashes (at two percent).

Table 3.5 Safety Performance Measures by Scenario

	Crashes Per Million VMT				Total Crashes – Deviation from Base
	Fatalities	Injuries	Property Damage	Total Crashes	
Base Future	0.483	46.202	66.498	113.182	
Enhanced Future	0.480	45.813	66.068	112.362	-0.73%
SEMNPTS Corridors	0.437	41.380	59.074	100.891	-10.86%
Refined All Corridors	0.446	42.230	60.409	103.084	-8.92%
Corridor Concept	0.456	43.267	62.051	105.774	-6.55%
Corridor Concept Plus	0.456	43.214	61.987	105.656	-6.65%

Table 3.6 Safety Performance Measures by Subarea and Scenario

Subarea	Scenario	Total Crashes – Deviation from Base
Chandler/Gilbert	Enhanced Future	-0.9%
	SEMNPTS Corridors	-0.7%
	Refined All Corridors	5.5%
	Corridor Concept	-0.1%
	Corridor Concept Plus	-2.0%
Eloy/Coolidge	Enhanced Future	-11.7%
	SEMNPTS Corridors	16.1%
	Refined All Corridors	-9.3%
	Corridor Concept	-11.6%
	Corridor Concept Plus	-13.5%
GRIC	Enhanced Future	3.5%
	SEMNPTS Corridors	-13.3%
	Refined All Corridors	-14.4%
	Corridor Concept	-7.9%
	Corridor Concept Plus	0.1%

The Eloy/Coolidge subarea shows the greatest improvements over the base case. Each of the scenarios decreases the crash rate between 9 and 14 percent, with the greatest benefit to the Corridor Concept Plus scenario.

In the GRIC subarea, the Refined All Corridors scenario has the greatest impact on crash rates, as some trips shift off of the facilities within this subarea and onto the new corridors. In the Corridor Concept Plus scenario, the rate actually increases slightly, as the newly-widened state highway in this area shows substantially improved speed. Again, this does not take into account any potential changes to this facility that could help mitigate increases in crash rates. For example, widening a major state highway from two to four lanes could also include installation of a median and other safety devices that would substantially reduce crashes on the facility.

The other two subareas (not shown in Table 3.6) had changes in crash rates that are consistent with the overall change presented in Table 3.5.

3.4 Resource Conservation

The following two performance measures were used to estimate the resource conservation factor:

1. **Fuel consumption** provides a measure of resource use that varies with traffic volumes and congestion levels. Extreme congestion (stop-and-go traffic) leads to high levels of fuel consumption. However, the relationship between fuel consumption and travel speeds is not linear. A completely free-flow travel network will have higher fuel consumption than a moderately congested network. Fuel consumption rates were derived from IDAS.

2. **Emissions** provide an estimate of the environmental impact of the level of use of the transportation system. Emissions are estimated using the tonnage of key pollutants emitted due to travel on the roadway network. Specific pollutants included in analysis are nitrous oxides (NO_x), hydrocarbons (HC), and carbon monoxide (CO). Travel speeds have similar impacts on this performance measure as they do on fuel consumption. Emissions rates were also derived from IDAS for this analysis.

Each of the scenarios leads to a decrease in fuel consumption and the production of emissions relative to the Base Future scenario (Table 3.7). This suggests that the various alternatives are moving the network from high levels of congestion to moderate or acceptable levels of congestion. For both fuel consumption and emissions, the Refined All Corridors and Corridor Concept Plus scenarios have the greatest impact. The Enhanced Future and Corridor Concept scenarios show similar improvements to both fuel consumption and

emissions, each three to four percent lower than the Refined All Corridors and Corridor Concept Plus scenarios.

Table 3.7 Resource Conservation Performance Measures by Scenario

	Deviation from Base Scenario	
Scenario	**Fuel Consumption**	**Emissions**
Enhanced Future	-17.1%	-12.8%
SEMNPTS Corridors	-15.3%	-15.5%
Refined All Corridors	-20.8%	-17.6%
Corridor Concept	-15.0%	-12.7%
Corridor Concept Plus	-20.8%	-16.1%

The individual subareas show substantial variations across the Corridor Concept Plus scenario (Table 3.8). The Apache Junction/Mesa, GRIC, and Queen Creek/Florence subareas all show large decreases in fuel consumption and emissions. Emissions reduction is consistent for these three subareas (at around 20 percent), but fuel consumption varies more significantly (from 22 percent for Apache Junction/Mesa to almost 32 percent for GRIC).

Table 3.8 Resource Conservation Performance Measures by Subarea
Corridor Concept Plus Scenario

	Deviation from Base	
Subarea	**Fuel Consumption**	**Emissions**
Apache Junction/Mesa	-22.3%	-21.1%
Chandler/Gilbert	-3.6%	-3.1%
Eloy/Coolidge	-4.3%	-9.1%
GRIC	-31.5%	-20.4%
Queen Creek/Florence	-27.3%	-20.5%

The proposed scenarios have relatively less impact in the Chandler/Gilbert or Eloy/Coolidge subareas. These areas show around a four-percent reduction in fuel consumption and between three and nine-percent reduction in emissions. These areas see less

benefit because of the location of the new facilities that are proposed as part of the Corridor Concept Plus scenario. The benefits that are exhibited suggest that individuals are altering their trip patterns to take advantage of the new facilities, creating benefits across the system.

Trends across the subareas for other scenarios are consistent with the results presented here. The Corridor Concept Plus scenario shows somewhat greater improvements in resource conservation than Corridor Concept scenario for all subareas (though generally not by a significant margin).

3.5 Environmental Justice

Environmental justice (EJ) reflects a combination of resource conservation and accessibility concerns. A "concentration" of EJ populations is defined as census blocks that contain a percentage of EJ populations that is greater than the regional average. The intensity of these concentrations is measured by the relative variation from the regional average. Relative variation is measured using the concept of standard deviation, which captures how different a particular zone analyzed is from the average of all zones in the network. In this case, we are examining areas that have a greater concentration of a particular attribute (e.g., residents over the age of 65). In the results in the following figures, darker shading indicates a greater concentration of that group.

The analysis here goes as far as identifying the location of EJ population concentrations and their proximity to the proposed corridors and the locations in the network where congestion, pollution, and/or safety concerns are forecasted to occur. Population density was also taken into account in order to verify the extent of such impacts. Three key Environmental Justice populations are examined here:

1. **Minority** populations are identified as populations that are of a race other than non-Hispanic white or are of multiple races.

2. **Impoverished** populations are determined by examining three measures: population living below the poverty line, households living below 50 percent of the poverty line, and households with zero vehicles.

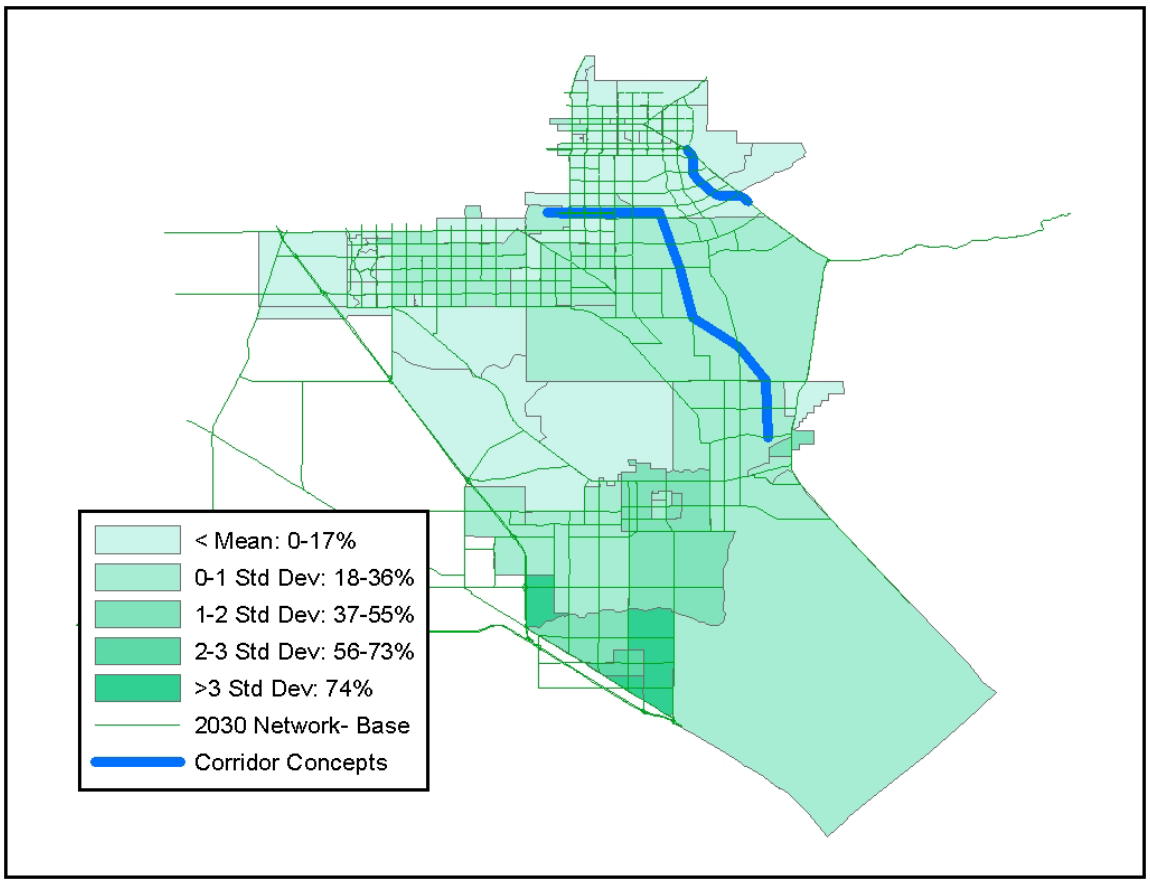
3. **Elderly** populations are defined to include those people over the age of 65.

Minorities

The largest minority populations are found in the southern parts of the Eloy/Coolidge region (to the southeast of Casa Grande, as shown in Figure 3.4). By examining the subarea breakdown of other performance measures in this region, the impact on this population may be clarified.

With respect to mobility performance measures, this subarea has much lower total VMT and VHT due to lower total population. Despite this, all scenarios lead to improvements. In terms of resource conservation, the positive impact of proposed projects with respect to the base future scenario is less than in other regions (Apache Junction/Mesa, GRIC, and Queen Creek/Coolidge). This holds true across the scenarios.

Figure 3.4 Percent of Population Defined as Minority

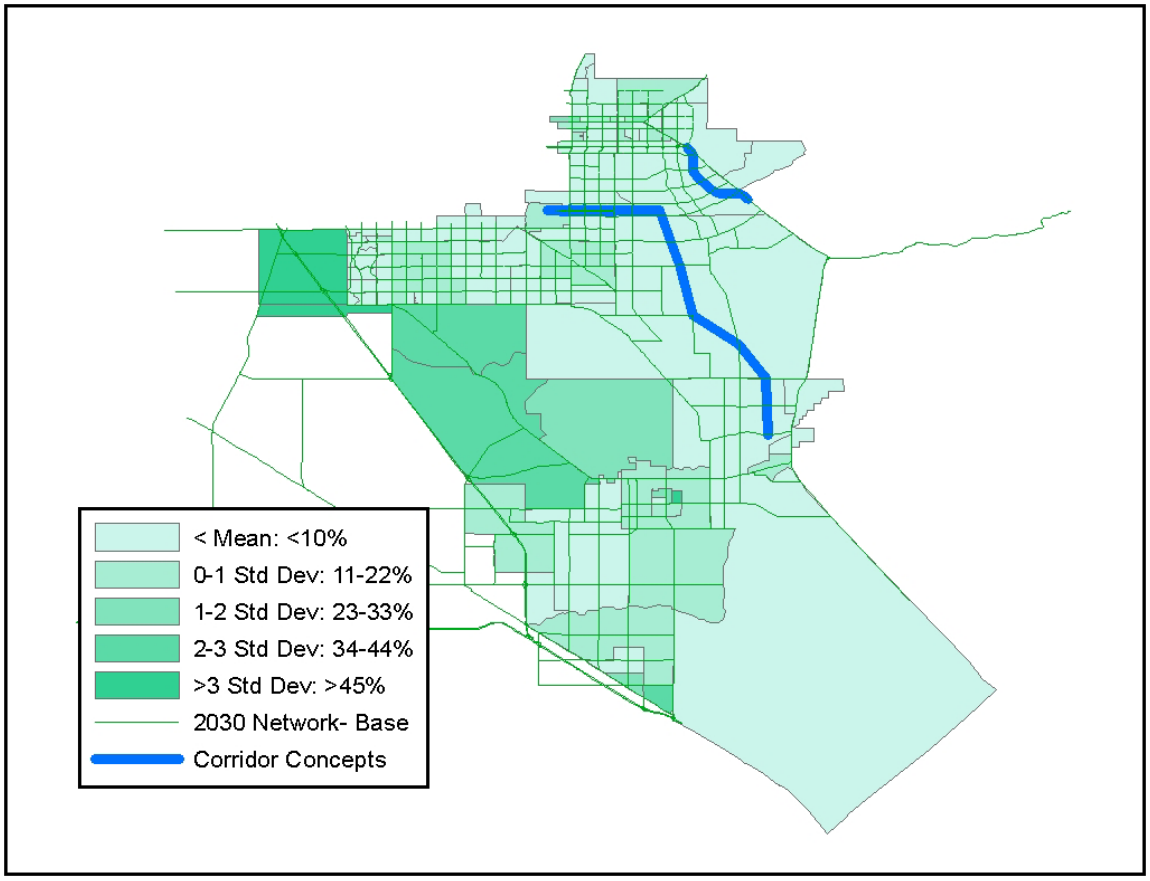


Poverty

The three gauges for poverty (households below the poverty line, people below 50 percent of the poverty line, and zero vehicle households) all indicated the same areas as relatively impoverished (see Appendix A for additional performance measure maps). The most significant of these encompasses virtually all of the GRIC subarea (Figure 3.5). The Eloy/Coolidge subarea also has higher rates of poverty than other regions in the study area.

The GRIC subarea shows relative improvements in all mobility performance measures on par with other subareas for each scenario. However, the limited roadway network in this area is the most congested in the Base Future and remains the most congested across all scenarios. The Refined All Corridors case provides the most improvement over the base case in mobility measures, but both the Corridor Concept and Corridor Concept Plus scenarios provide significant benefits as well. For safety, the enhanced Future and Corridor Concept Plus scenarios actually result in small increases in crash rate. The Refined All Corridors and Corridor Concept scenario both provide some improvement in crash rates. Fuel consumption and emissions rates show significant improvements in the GRIC subarea for every scenario.

Figure 3.5 Percent of Households Below the Poverty Line



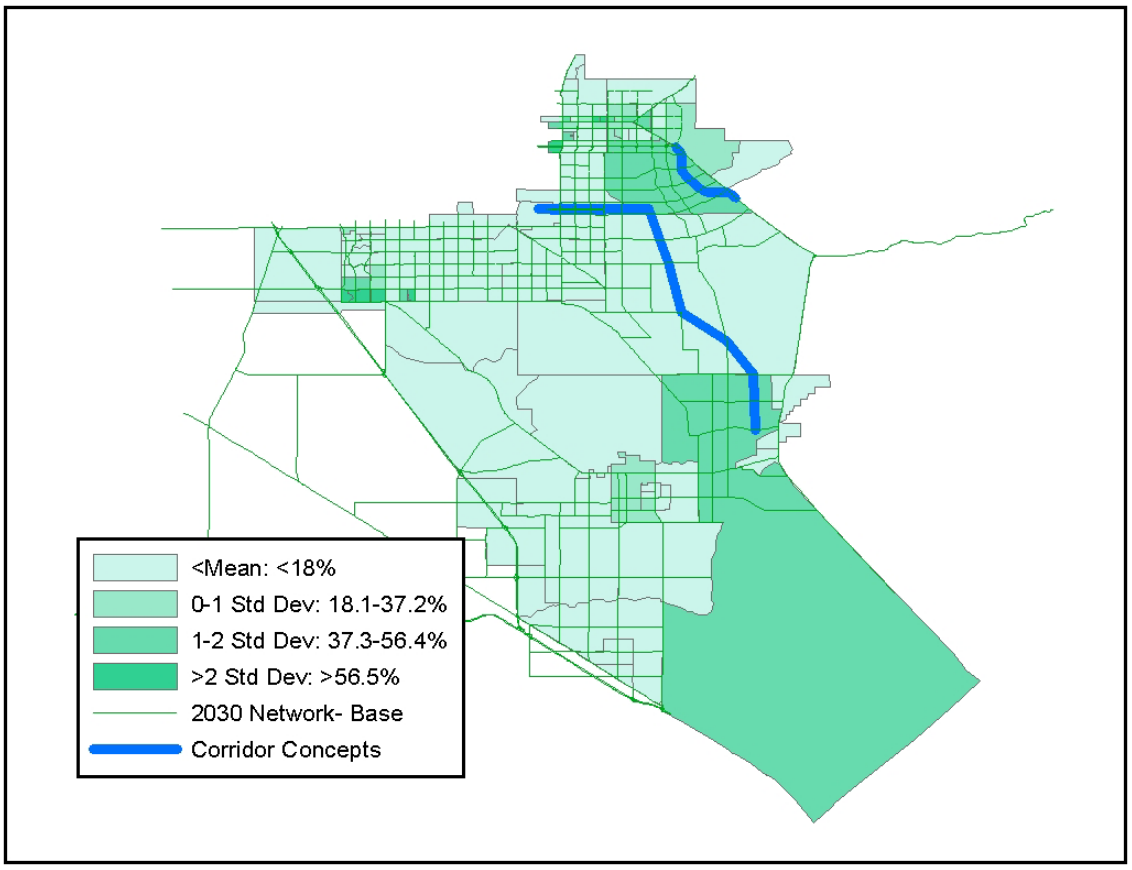
Age

The largest relative populations of elderly people can be found right in the U.S. 60 reroute corridor reaching west to the Williams Gateway Corridor. Figure 3.6 shows that this

population is most concentrated in the middle of proposed development and in the Apache Junction/Mesa subarea. There are a few other subareas with high relative elderly densities, but low population densities make them less significant.

Improvements to mobility performance measures are strong across all performance measures in this subarea. Those that involve development of the corridors provide the greatest impact. Crash rates follow a similar pattern to the systemwide result, except that the Corridor Concept and Corridor Concept Plus scenarios provide relatively safer roads. Improvements to fuel consumption and emissions in comparison to the Base Future scenario are among the best in all scenarios in the Apache Junction/Mesa subarea.

Figure 3.6 Percent of Population Over the Age of 65



Appendix A. Detailed Performance Tables

A.1 Mobility Tables

This section presents the detailed analysis of mobility.

Table A.1 Mobility Performance Measures by Scenario

	Total VHT	Total VMT	% Network V/C>1	% Network V/C>1.5
Base Future	4,551,023	32,113,122	41.0%	7.9%
Enhanced Future	3,261,492	31,619,784	32.2%	3.0%
SEMNPTS Corridors	2,682,051	32,973,195	26.1%	2.1%
Refined All Corridors	2,497,108	32,955,369	24.4%	1.7%
Corridor Concept	3,207,121	32,438,746	29.2%	3.5%
Corridor Concept Plus	2,994,424	32,252,439	27.9%	2.8%

Table A.2 Mobility Performance Measure Deviation from Base Case by Scenario

	Total VHT	Total VMT	% Network V/C>1	% Network V/C>1.5
Enhanced Future	-28.33%	-1.54%	-21.52%	-62.11%
SEMNPTS All Corridors	-41.07%	2.68%	-36.34%	-73.42%
Refined All Corridors	-45.13%	2.62%	-40.64%	-78.12%
Corridor Concept	-29.53%	1.01%	-28.72%	-55.86%
Corridor Concept Plus	-34.20%	0.43%	-32.07%	-64.49%

Table A.3 Mobility Performance Measures by Subregion and Scenario

		Total VHT	VHT Deviation from Base	Total VMT	VMT Deviation from Base	% Network V/C>1	% Network V/C>1.5
Apache Junction/ Mesa	Base Future	741,843		7,896,442		30.9%	2.8%
	Enhanced Future	463,605	-37.5%	7,921,698	0.3%	18.9%	1.0%
	SEMNPTS Corridors	275,505	-62.9%	7,909,004	0.2%	7.3%	0.1%
	Refined All Corridors	268,888	-63.8%	7,761,615	-1.7%	5.9%	0.1%
	Corridor Concept	325,732	-56.1%	8,316,768	5.3%	9.0%	0.7%
	Corridor Concept Plus	308,496	-58.4%	8,252,473	4.5%	7.4%	0.2%
Chandler/ Gilbert	Base Future	895,672		6,273,553		71.8%	1.6%
	Enhanced Future	880,170	-1.7%	6,215,537	-0.9%	69.3%	1.6%
	SEMNPTS Corridors	842,013	-6.0%	6,923,067	10.3%	61.7%	1.6%
	Refined All Corridors	880,335	-1.7%	6,803,304	8.4%	69.1%	1.6%
	Corridor Concept	939,969	4.9%	6,269,807	-0.1%	70.1%	1.6%
	Corridor Concept Plus	878,372	-1.9%	6,148,579	-2.0%	69.9%	1.4%
Eloy/ Coolidge	Base Future	218,030		6,042,944		7.6%	0.4%
	Enhanced Future	179,555	-17.6%	5,484,940	-9.2%	4.7%	0.4%
	SEMNPTS Corridors	172,291	-21.0%	5,433,602	-10.1%	3.3%	0.3%
	Refined All Corridors	174,885	-19.8%	5,531,845	-8.5%	3.8%	0.3%
	Corridor Concept	185,226	-15.0%	5,513,505	-8.8%	4.4%	0.3%
	Corridor Concept Plus	170,819	-21.7%	5,405,756	-10.5%	2.8%	0.4%
GRIC	Base Future	1,120,126		5,298,075		68.2%	33.0%
	Enhanced Future	867,301	-22.6%	5,213,386	-1.6%	61.2%	15.2%
	SEMNPTS Corridors	646,517	-42.3%	4,774,334	-9.9%	55.8%	9.5%
	Refined All Corridors	597,314	-46.7%	4,639,259	-12.4%	57.7%	9.2%
	Corridor Concept	852,112	-23.9%	4,903,650	-7.4%	59.5%	19.6%
	Corridor Concept Plus	790,131	-29.5%	5,055,372	-4.6%	64.9%	14.1%
Queen Creek/ Florence	Base Future	1,575,353		6,602,108		65.2%	20.1%
	Enhanced Future	870,860	-44.7%	6,784,222	2.8%	45.8%	5.3%
	SEMNPTS Corridors	745,726	-52.7%	7,933,188	20.2%	42.3%	4.6%
	Refined All Corridors	575,685	-63.5%	8,219,346	24.5%	29.0%	2.9%
	Corridor Concept	904,082	-42.6%	7,435,015	12.6%	44.9%	6.3%
	Corridor Concept Plus	846,607	-46.3%	7,390,260	11.9%	40.8%	6.1%

A.2 Safety Tables

This section presents the detailed analysis of safety.

Table A.4 Safety Performance Measure Deviation from Base Future by Scenario

	Total Crashes
Enhanced Future	-0.73%
SEMNPTS Corridors	-10.86%
All Corridors	-8.92%
Corridor Concept	-6.55%
Corridor Concept Plus	-6.65%

Table A.5 Safety Performance Measure by Scenario

Incidents Per Million Vehicle Miles Traveled

	Fatalities	Injuries	PDO	Total Crashes
Base Future	0.483	46.202	66.498	113.182
Enhanced Future	0.480	45.813	66.068	112.362
SEMNPTS Corridors	0.437	41.380	59.074	100.891
Refined All Corridors	0.446	42.230	60.409	103.084
Corridor Concept	0.456	43.267	62.051	105.774
Corridor Concept Plus	0.456	43.214	61.987	105.656

Table A.6 Safety Performance Measure Deviation from Base by Subregion and Scenario

		Total Crashes
Apache Junction/Mesa	Enhanced Future	**0.9%**
	SEMNPTS Corridors	**-16.6%**
	Refined All Corridors	**-16.2%**
	Corridor Concept	**-9.7%**
	Corridor Concept Plus	**-10.4%**
Chandler/ Gilbert	Enhanced Future	**-0.9%**
	SEMNPTS Corridors	**-0.7%**
	Refined All Corridors	**5.5%**
	Corridor Concept	**-0.1%**
	Corridor Concept Plus	**-2.0%**
Eloy/ Coolidge	Enhanced Future	**-11.7%**
	SEMNPTS Corridors	**-16.1%**
	Refined All Corridors	**-9.3%**
	Corridor Concept	**-11.6%**
	Corridor Concept Plus	**-13.5%**
GRIC	Enhanced Future	**3.5%**
	SEMNPTS Corridors	**-13.3%**
	Refined All Corridors	**-14.4%**
	Corridor Concept	**-7.9%**
	Corridor Concept Plus	**0.1%**
Queen Creek/ Florence	Enhanced Future	**2.8%**
	SEMNPTS Corridors	**-10.1%**
	Refined All Corridors	**-12.2%**
	Corridor Concept	**-5.6%**
	Corridor Concept Plus	**-5.9%**

A.3 Accessibility Figures and Tables

This section presents the detailed figures and tables for accessibility.

Table A.7 Percent of Trips to Activity Center by Time Band and Scenario

	Apache Junction			Chandler		
	0-15	**15-30**	**30-45**	**0-15**	**15-30**	**30-45**
Base Future	50.1%	30.2%	2.3%	58.3%	30.2%	4.0%
Enhanced Future	55.2%	27.4%	1.7%	63.0%	25.6%	4.6%
Refined All Corridors	77.9%	17.8%	2.4%	61.2%	27.8%	4.2%
Corridor Concept	73.6%	20.0%	1.7%	60.7%	27.9%	4.5%
Corridor Concept Plus	73.6%	20.0%	1.7%	60.7%	27.9%	4.5%
	Williams Gateway			**Coolidge**		
	0-15	**15-30**	**0-15**	**15-30**	**0-15**	**15-30**
Base Future	27.9%	9.7%	27.9%	9.7%	27.9%	9.7%
Enhanced Future	28.7%	24.3%	28.7%	24.3%	28.7%	24.3%
Refined All Corridors	47.1%	25.8%	47.1%	25.8%	47.1%	25.8%
Corridor Concept	30.3%	27.2%	30.3%	27.2%	30.3%	27.2%
Corridor Concept Plus	31.0%	32.2%	31.0%	32.2%	31.0%	32.2%

Figure A.1 Accessibility to Apache Junction Activity Center
Base Future Scenario

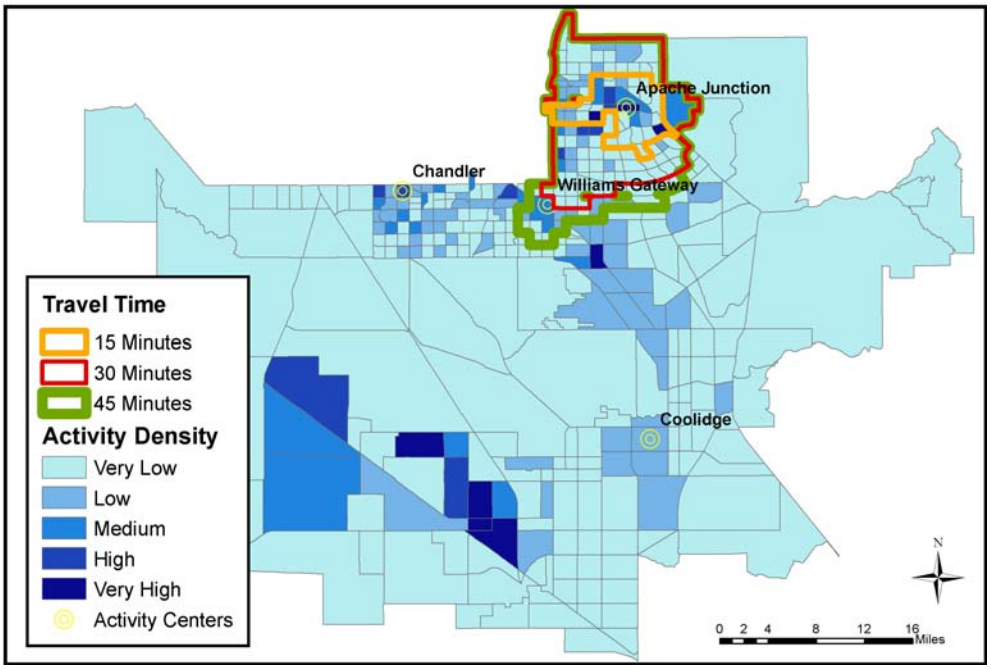


Figure A.2 Accessibility to Apache Junction Activity Center
Enhanced Future Scenario

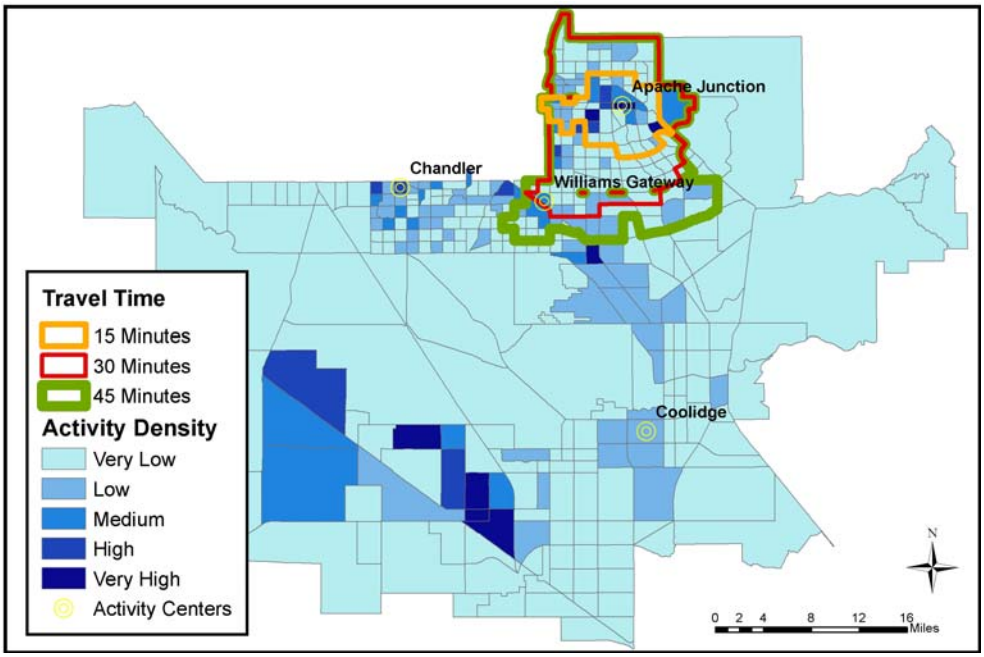


Figure A.3 Accessibility to Apache Junction Activity Center
Refined All Corridors Scenario

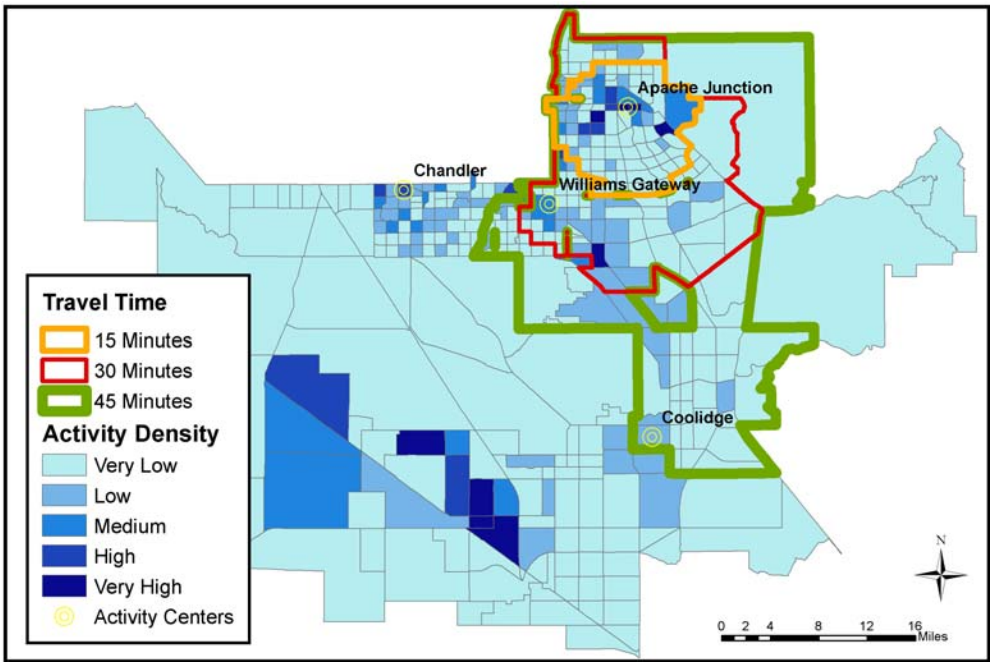


Figure A.4 Accessibility to Apache Junction Activity Center
Corridor Concept Scenario

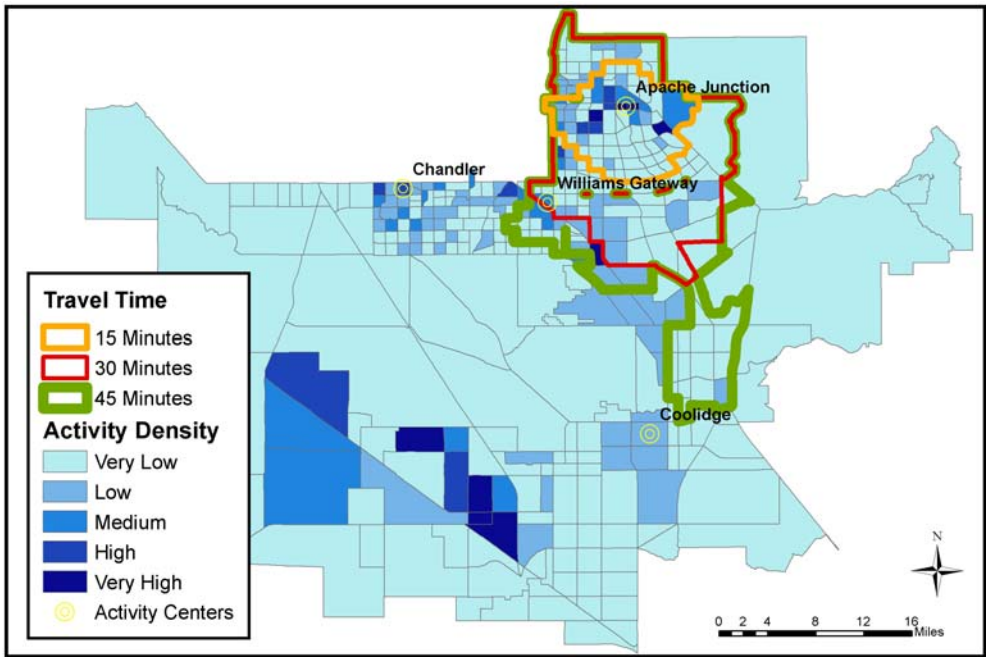


Figure A.5 Accessibility to Apache Junction Activity Center
Corridor Concept Plus Scenario

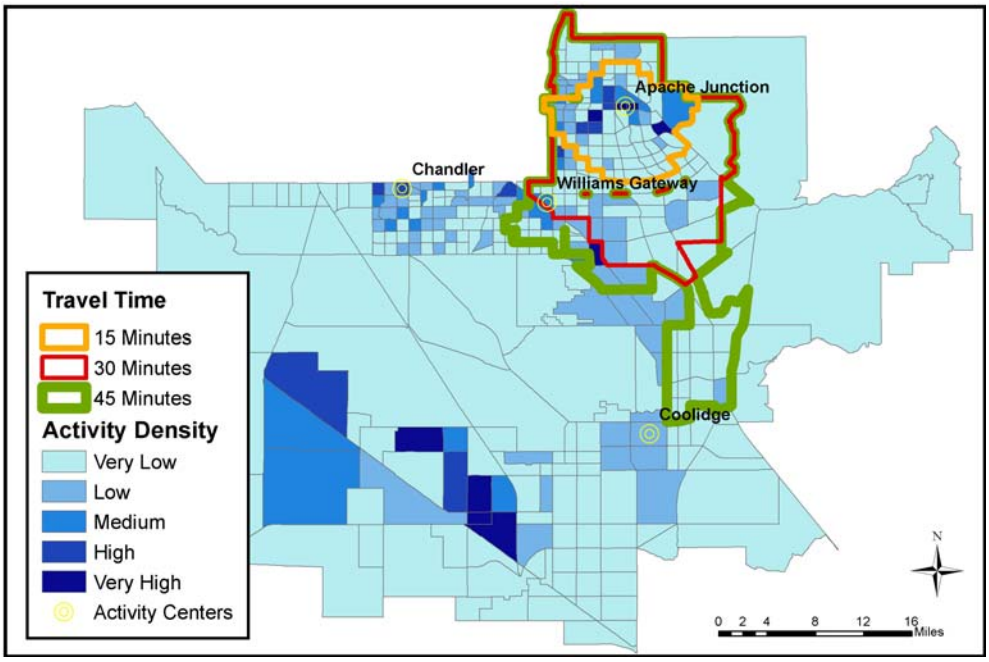


Figure A.6 Accessibility to Chandler Activity Center
Base Future Scenario

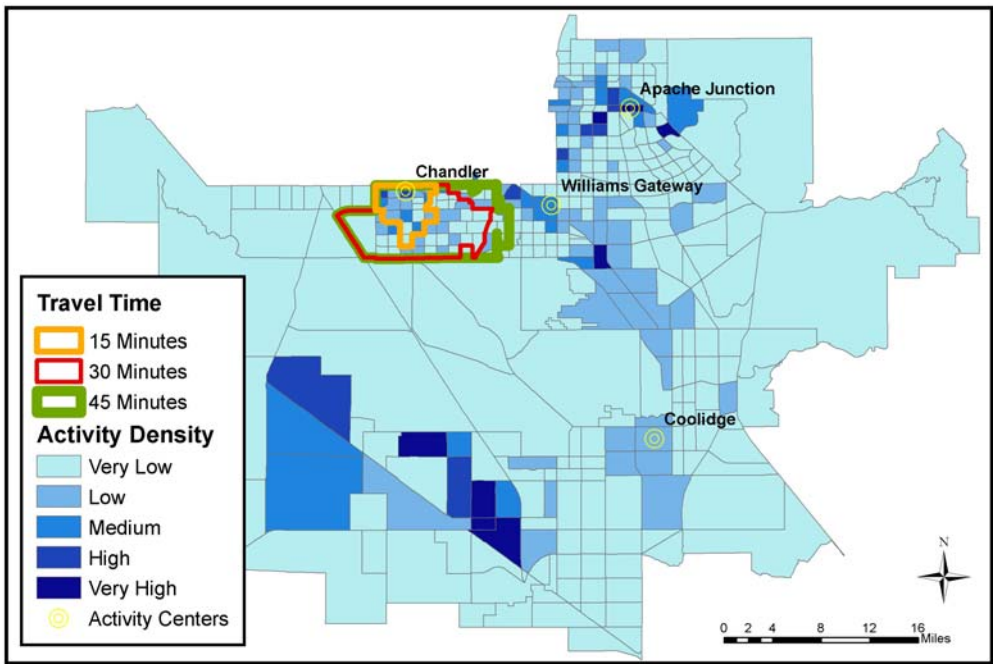


Figure A.7 Accessibility to Chandler Activity Center
Enhanced Future Scenario

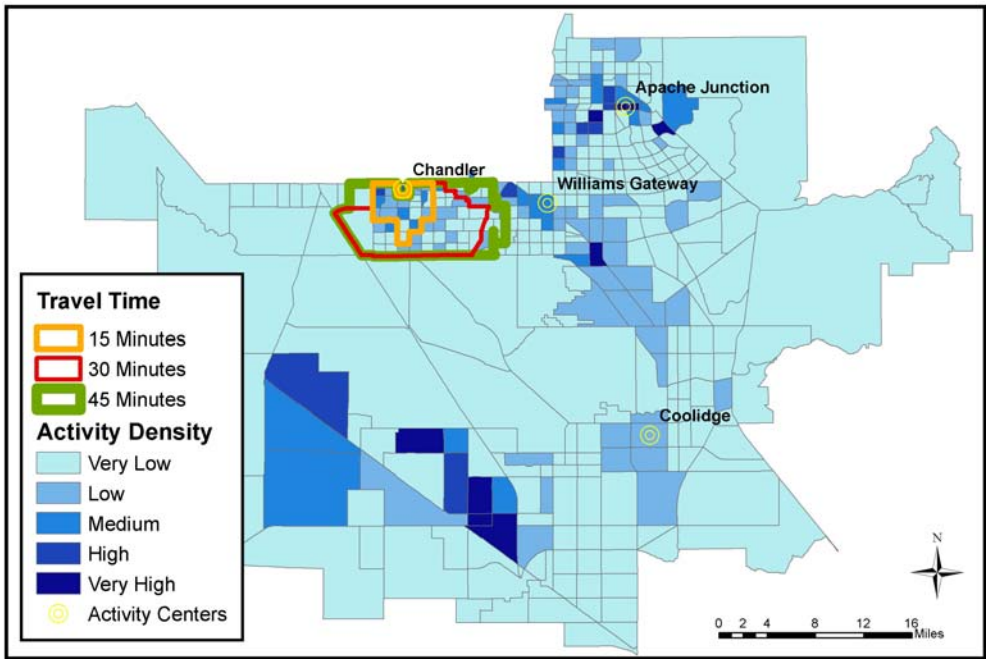


Figure A.8 Accessibility to Chandler Activity Center
All Corridors Scenario

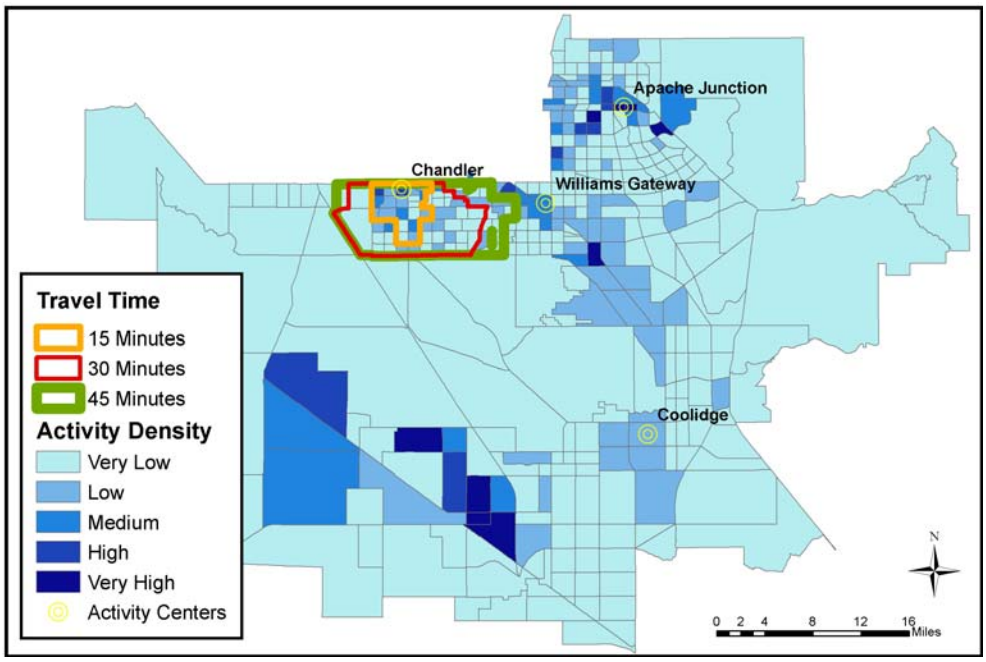


Figure A.9 Accessibility to Chandler Activity Center
Corridor Concept Scenario

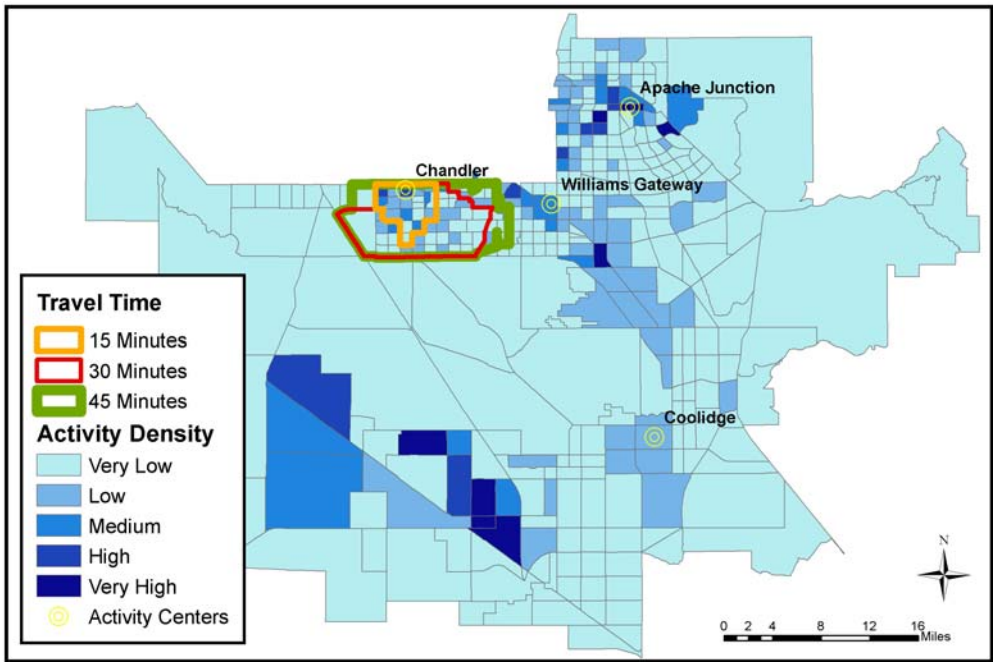


Figure A.10 Accessibility to Chandler Activity Center
Corridor Concept Plus Scenario

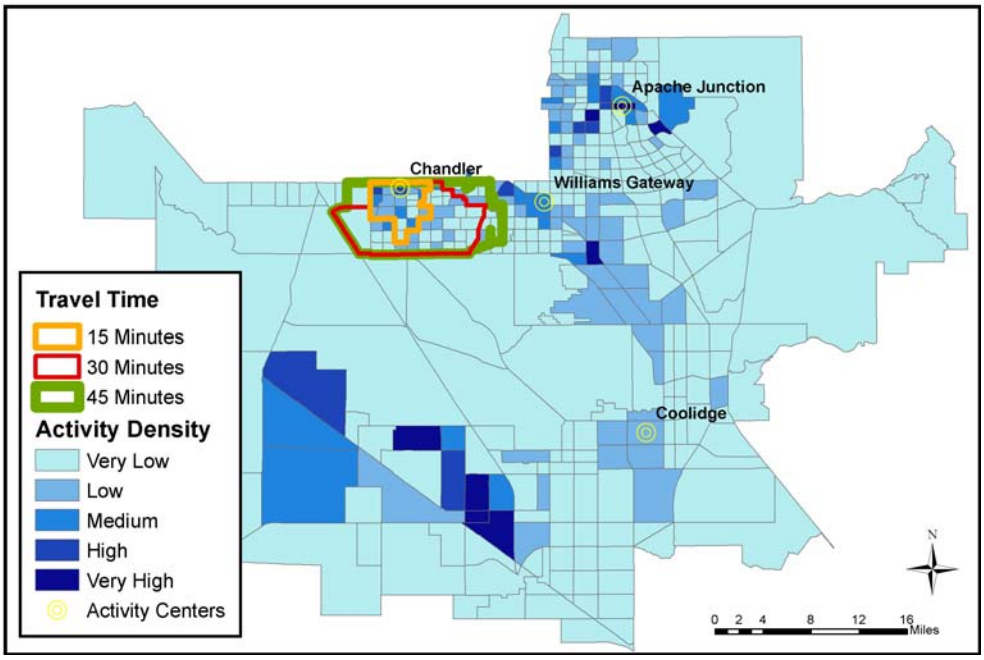


Figure A.11 Accessibility to Coolidge Activity Center
Base Future Scenario

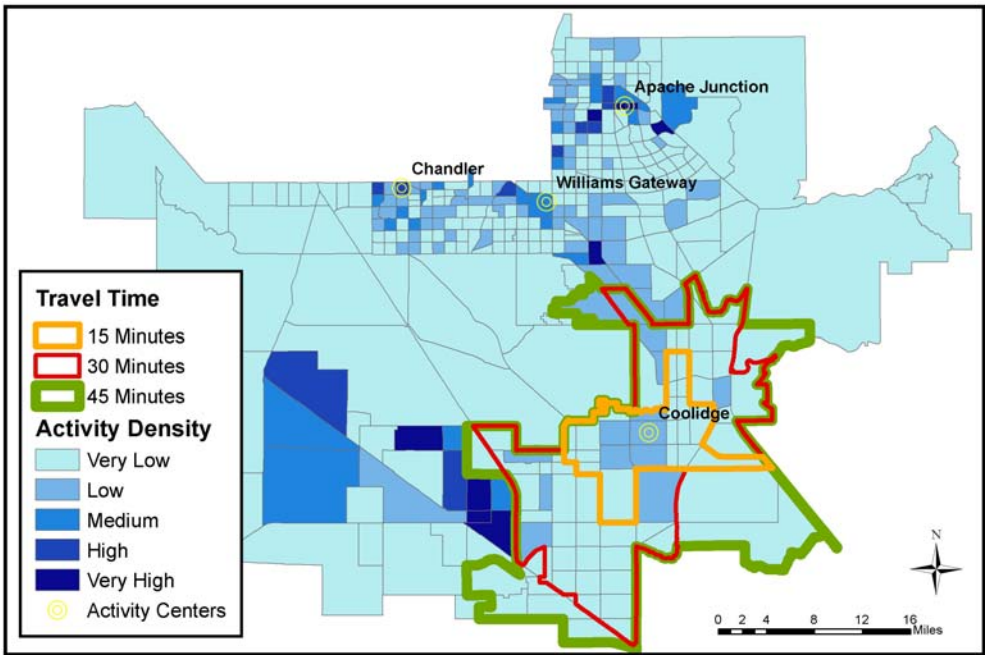


Figure A.12 Accessibility to Coolidge Activity Center
Enhanced Future Scenario

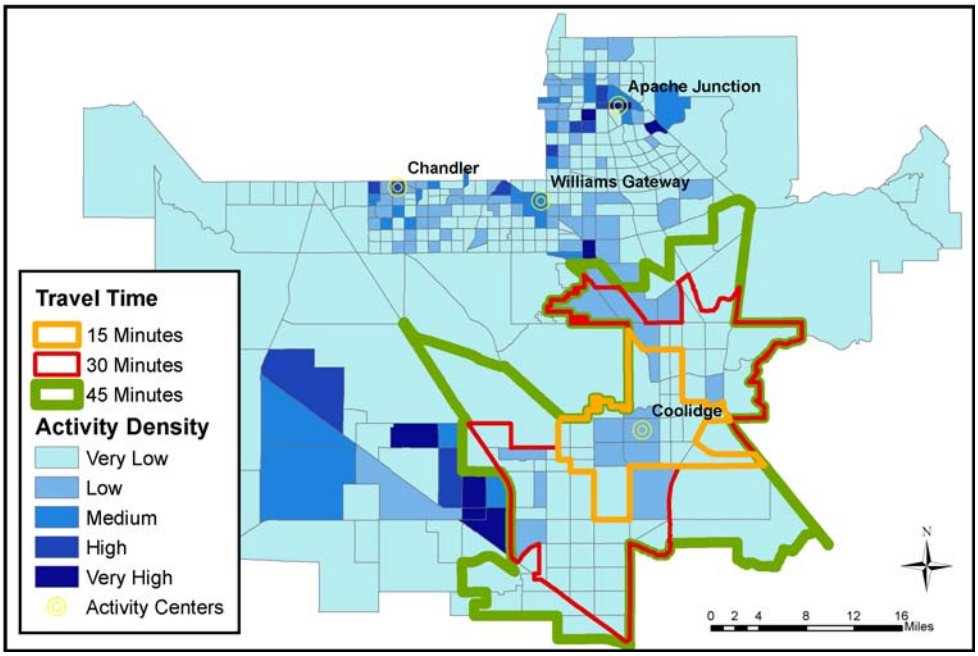


Figure A.13 Accessibility to Coolidge Activity Center
All Corridors Scenario

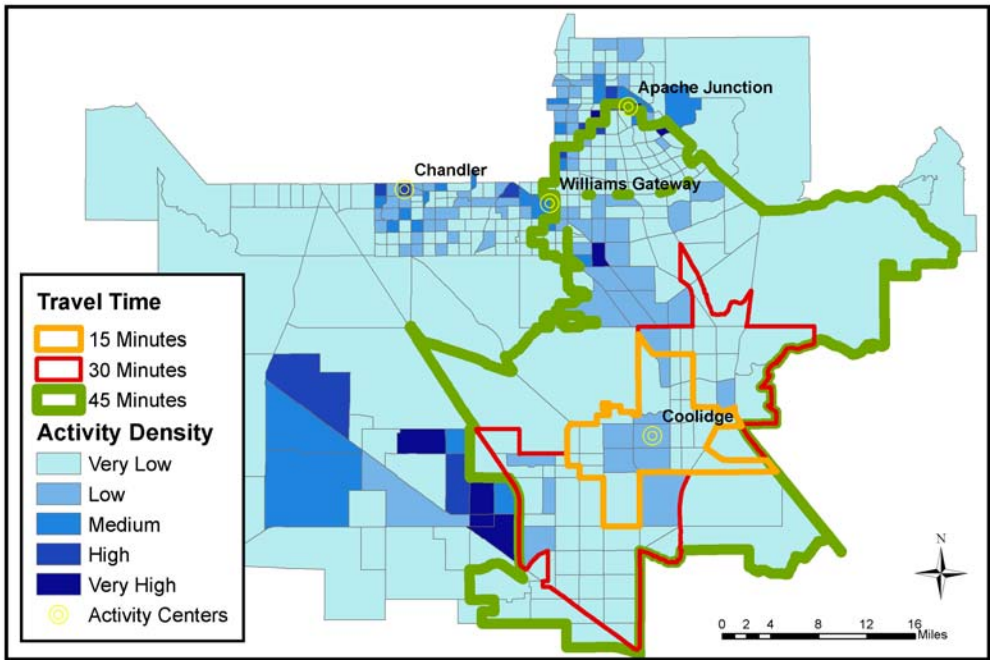


Figure A.14 Accessibility to Coolidge Activity Center
Corridor Concept Scenario

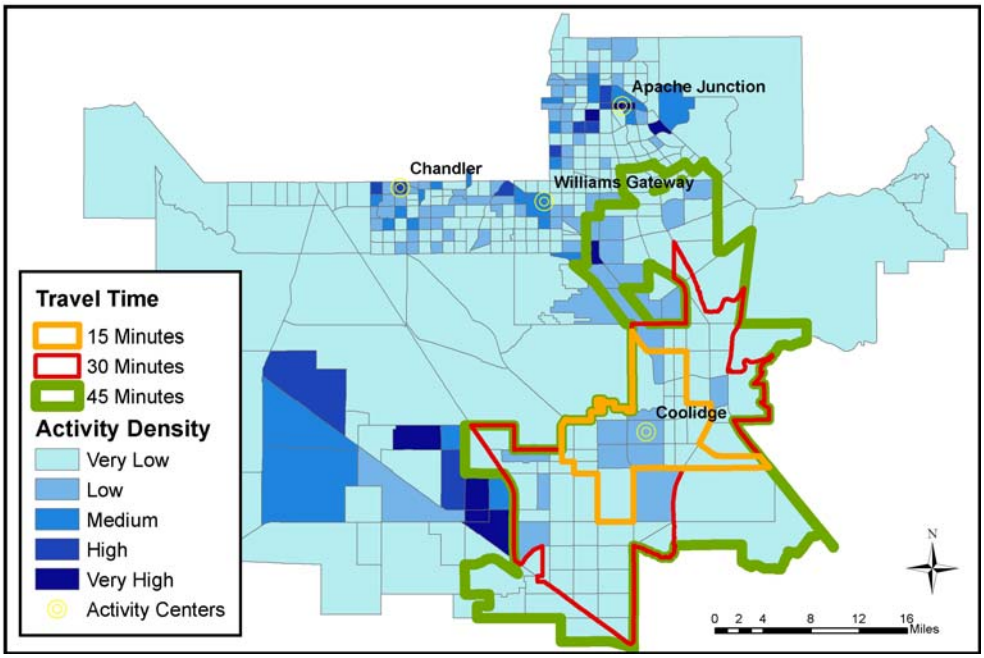


Figure A.15 Accessibility to Coolidge Activity Center
Corridor Concept Plus Scenario

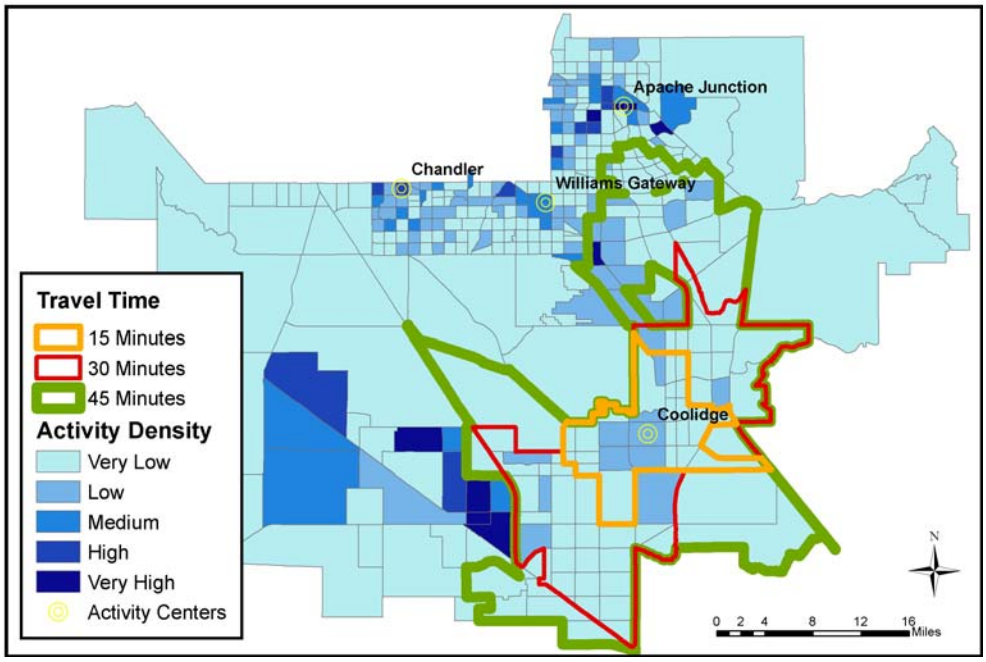


Figure A.6 Accessibility to Williams Gateway Activity Center
Base Future Scenario

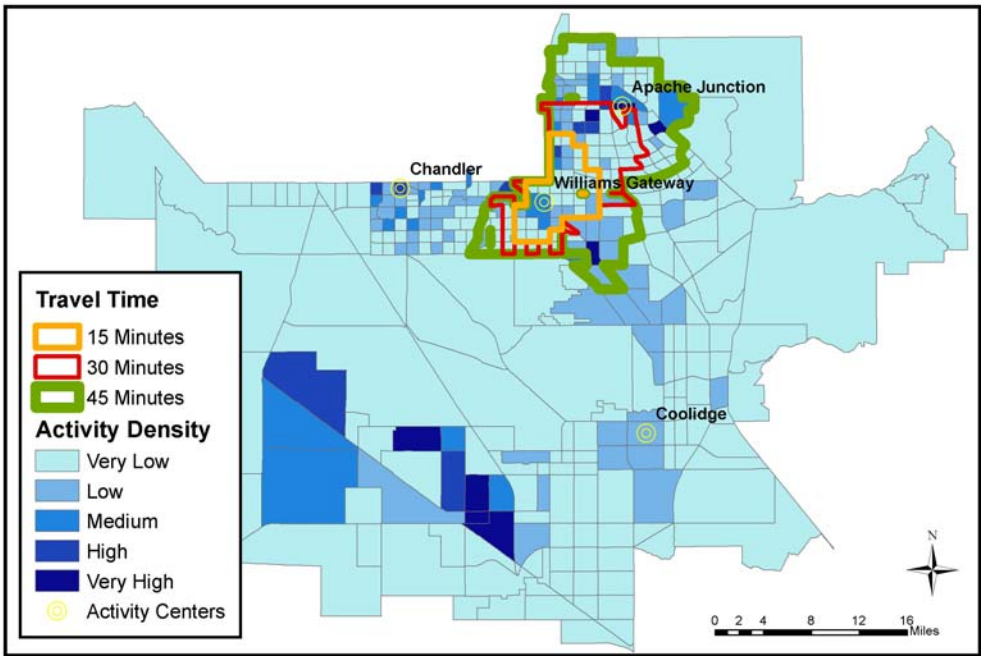


Figure A.7 Accessibility to Williams Gateway Activity Center
Enhanced Future Scenario

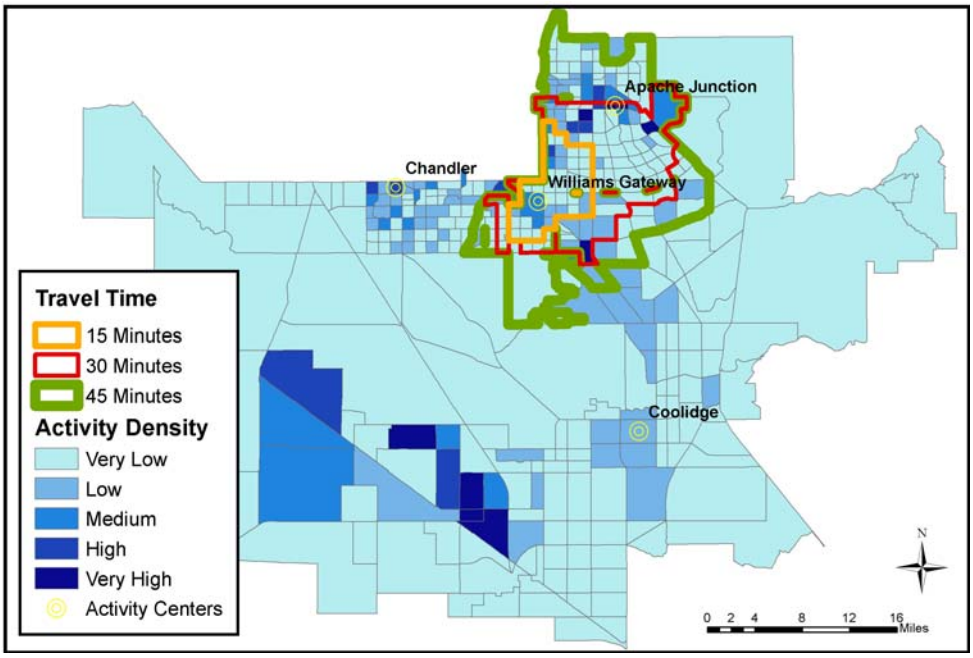


Figure A.8 Accessibility to Williams Gateway Activity Center
All Corridors Scenario

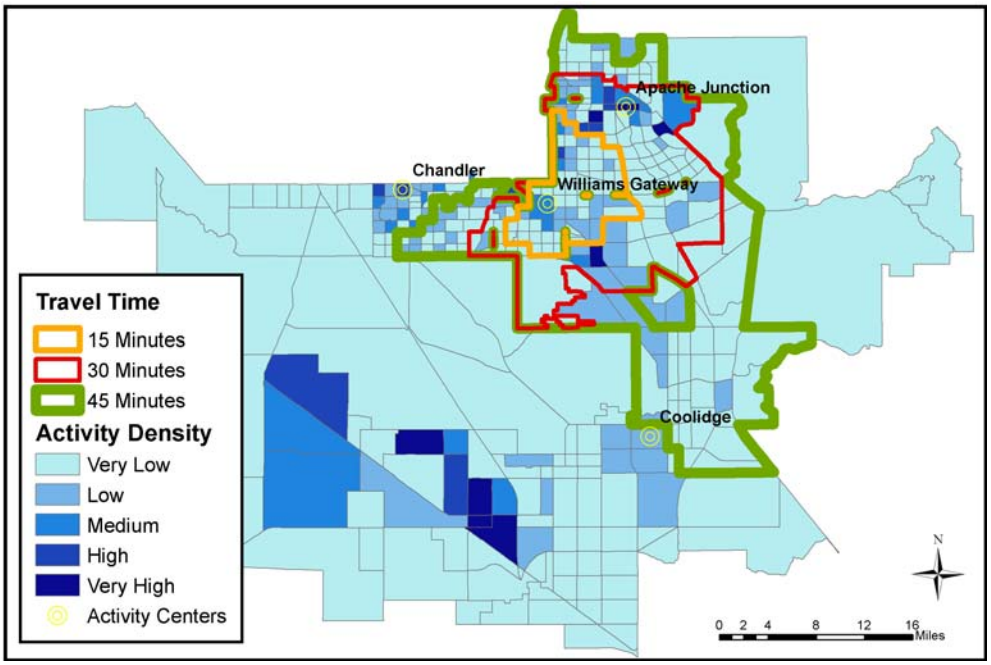


Figure A.9 Accessibility to Williams Gateway Activity Center
Corridor Concept Scenario

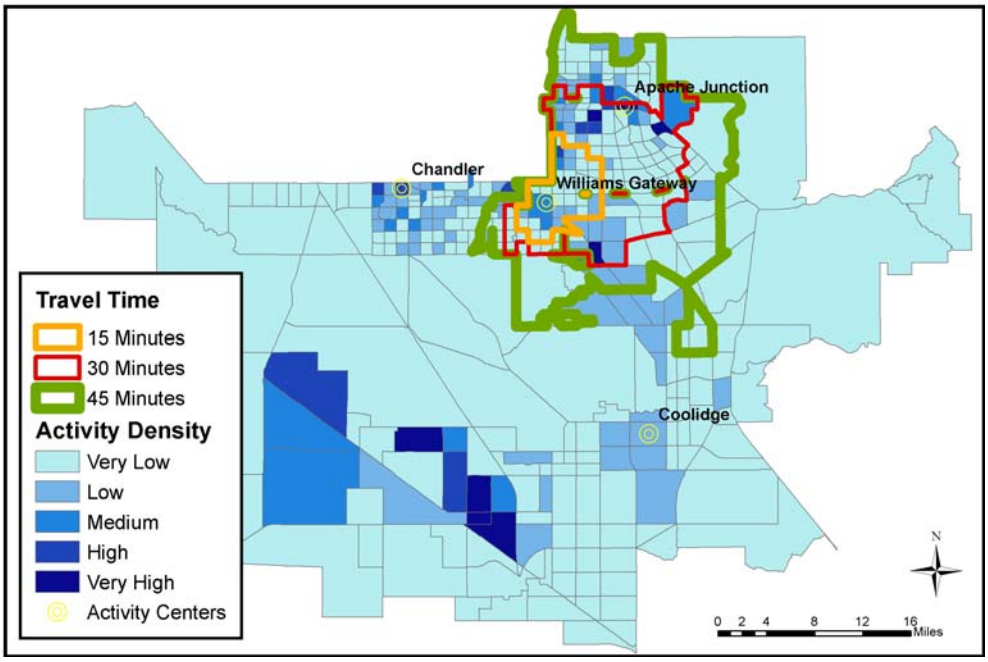
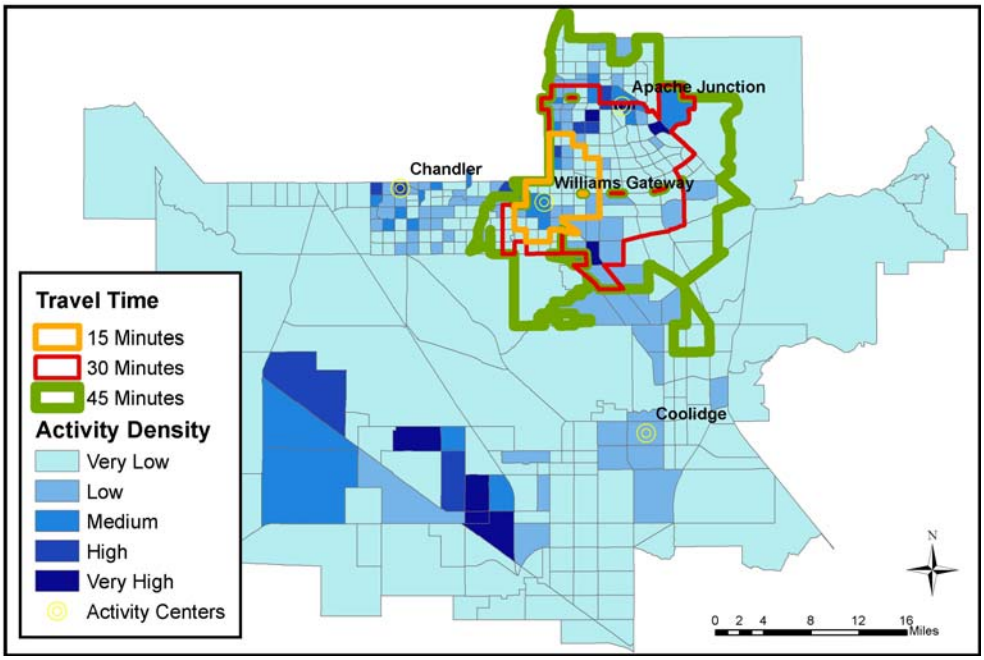


Figure A.10 Accessibility to Williams Gateway Activity Center
Corridor Concept Plus Scenario



A.4 Resource Conservation Tables

This section presents the detailed tables for resource conservation.

Table A.8 Resource Conservation Performance Measures
Deviation from Base by Scenario

	Fuel Consumption	Emissions
Enhanced Future	-17.1%	-12.8%
SEMNPTS Corridors	-15.3%	-15.5%
Refined All Corridors	-20.8%	-17.6%
Corridor Concept	-15.0%	-12.7%
Corridor Concept Plus	-20.8%	-16.1%

Table A.9 Resource Conservation Performance Measures

Deviation from Base by Subregion and Scenario

		Fuel Consumption	Emissions
Apache Junction/Mesa	Enhanced Future	-17.9%	-15.5%
	SEMNPTS Corridors	-24.7%	-24.8%
	Refined All Corridors	-27.9%	-27.0%
	Corridor Concept	-21.9%	-20.5%
	Corridor Concept Plus	-22.3%	-21.1%
Chandler/ Gilbert	Enhanced Future	-2.7%	-2.5%
	SEMNPTS Corridors	10.9%	3.2%
	Refined All Corridors	2.2%	2.4%
	Corridor Concept	1.0%	0.5%
	Corridor Concept Plus	-3.6%	-3.1%
Eloy/ Coolidge	Enhanced Future	-5.0%	-8.5%
	SEMNPTS Corridors	-3.9%	-9.2%
	Refined All Corridors	-2.5%	-6.9%
	Corridor Concept	-4.6%	-7.9%
	Corridor Concept Plus	-4.3%	-9.1%
GRIC	Enhanced Future	-16.8%	-9.0%
	SEMNPTS Corridors	-29.3%	-23.2%
	Refined All Corridors	-32.6%	-25.1%
	Corridor Concept	-17.4%	-12.9%
	Corridor Concept Plus	-31.5%	-20.4%
Queen Creek/ Florence	Enhanced Future	-32.1%	-22.2%
	SEMNPTS Corridors	-15.7	-17.1
	Refined All Corridors	-26.2%	-21.6%
	Corridor Concept	-22.8%	-17.3%
	Corridor Concept Plus	-27.3%	-20.5%